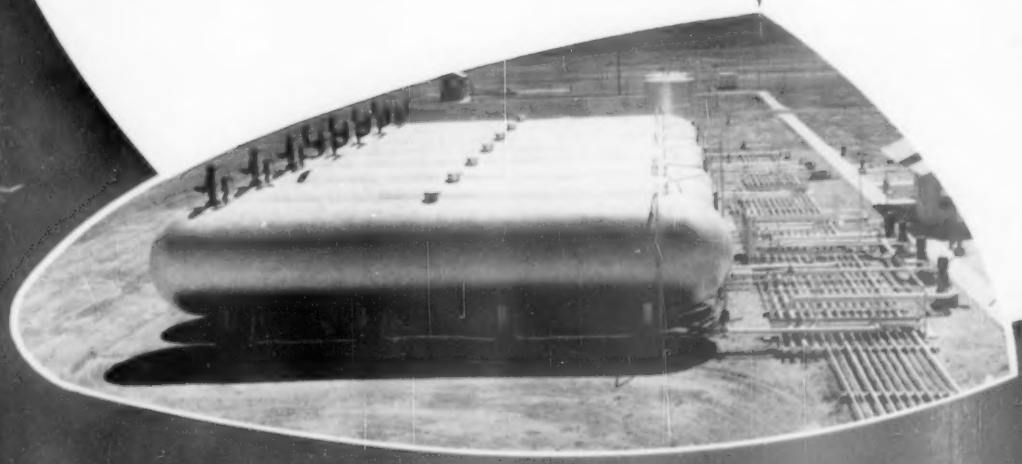
the OIL AND GAS JOURNAL

MAY 23, 1955

What Next for L.P.G.?

Last winter the industry got caught in a price trap. Storage can be the needed stabilizer—IF . . .

Page 78



Increasing gas "imports" causing concern among California refiners . . . p. 82

RESEARCH

is our most important service

You may soon be our three-millionth customer. Whatever the job—a drill stem test, chemical treatment, fracturing, cementing, or well logging, its added importance will go unmarked. We know from great experience that research is our most important service. Research is the structural strength of Halliburton, develops and improves all its services, makes each job better day after day. Renowned 25 years ago for its "Stress and Strain Department," Halliburton now has two large technical centers of research—in Duncan and Houston—where the greatest skills of engineering, metallurgy, electronics and chemistry are dedicated solely to helping put more oil in your tanks. When our three-millionth job rolls round, it will be better than all before it, because research is our most important service.

HALLIBURTON OIL WELL CEMENTING COMPANY
DUNCAN, OKLAHOMA

PROGRESS IN SERVICE THROUGH RESEARCH

PAGE 1 ONE . . . a glance ahead

Major importers will make strenuous effort to reduce their foreign shipments to head off administration action under new law, but results won't be great before fall. Meanwhile summer decline in crude demand will spur domestic producers to get official action. This sparring match may last all year.

I rris bill may come out of House committee generally satisfactory to producers except for nullification of escalation clauses in existing contracts. In Senate hearings, industry is laying groundwork for legal and economic justification for price escalations in both old and new long-term gas sales.

Refinery construction budgets are being revised upward in midyear by several companies due to pressure of octane race and development of new processes for high-specification fuel components and more profitable utilization of various refinery cuts.

Look for FPC to make several important policy decisions on gas regulation during next month before Nelson Lee Smith leaves commission. His successor normally would not vote on cases pending at time he takes office.

Free-piston engine, soon to have a trial in an ocean vessel, is eyed by some pipeliners for powering gas compressors. Its potentialities for low fuel consumption would make it attractive to transmission companies where rising value of gas is a significant item of operating cost.

Bloom is off the boom in Australia. Disappointing series of dry holes followed sky-high excitement of first discovery. But after fly-by-night promoters are shaken out, patient, well-financed scientifically guided operators undoubtedly will find worthwhile production—frequently the pattern in new areas.

The OIL AND GAS JOURNAL

MAY 23, 1955 • VOLUME 54 • NUMBER 3

THE STAFF

TULSA OFFICE
211 South Cheyenne Ave.
Phone 3-6291

Kenneth B. Barnes ..... Editor
Henry D. Ralph ..... Chief Editorial Writer
Ted A. Armstrong ..... News Editor
Gerald L. Farrar ..... Engineering Editor
Dr. Frank J. Gardner ..... Exploration Editor
Paul Reed ..... Pipeline Editor
John C. Reidel ..... Petrochemical Editor
C. O. Willson ..... Consulting Editor
W. L. Nelson ..... Technical Editor
Lynn M. Nichols ..... Presentation Editor
John C. Casper ..... Economics Editor
Neil Williams ..... Associate Editor
Norman S. Morrisey ..... Drilling-Development Editor
Robert G. Deering ..... Assistant Pipeline Editor
R. B. Tuttle ..... Equipment Editor
W. A. Franklin ..... Assistant to Presentation Editor
Carl Hoot ..... District Editor
Carl J. Lawrence ..... District Editor
John C. McCaslin ..... District Editor
John M. McGivern ..... District Editor
Joe Reilly ..... District Editor
W. A. Bachman ..... District Editor
LaWanda Turner ..... Readership Research
Helen Brown ..... Editorial Assistant
Alice Burt ..... Editorial Assistant
Aileen Cantrell ..... Editorial Assistant
C. Dudley Johnston ..... Art Director
Jo Jeanne Speaker ..... Staff Artist

NEW YORK OFFICE
500 Fifth Avenue
Phone LOngacre 4-6160

George H. Weber ..... Refining Editor
Dahl M. Duff ..... International Editor

HOUSTON OFFICE
802 Sterling Building
Phone CHarter 4626

F. Lawrence Resen ..... District Editor
Edwin McGhee ..... District Editor
Paul Swain ..... District Editor

DALLAS OFFICE
1238 Mercantile Bank Building
Phone STerling 3074

Robert J. Enright ..... District Editor

LOS ANGELES OFFICE
650 South Grand Avenue
Phone VAndike 0722

D. H. Stormont ..... District Editor

WASHINGTON OFFICE
621 Albee Building
Phone District 7-1710

Bertram F. Linz ..... District Editor

Correspondents at Denver, Pittsburgh, Calgary, Columbus, Ashland, Ky., Oil City, Pa., Mount Pleasant, Mich., Melbourne, Australia; Regina, Sask.; Chatham, Ont.; and Casper, Wyo.

The Oil and Gas Journal, Published Mondays, copyright 1955, by The Petroleum Publishing Co. Entered as second-class matter September 1, 1910, at post office at Tulsa, Okla., under act of March 3, 1879. United States and foreign rates to the petroleum industry, 1 year $4, 2 years $7, 3 years $8.

IN THE NEWS

L.P.G. Facing Better Times After Record Slump 78
Texas Senate May Give Oil-Gas Industry Tax Relief 81
Humble Extends Ellenburger Trend in West Texas 81
Gas Imports Crimp California's Fuel Oil Markets 82
El Paso Natural To Boost its Gas Flow Westward 83
Pipeliners Told to Prepare for Wartime Damage 84
Handling Jet Fuel Hazardous Job for Pipelines 85
Spencer Chemical Dedicates New Plant at Orange 86
Louisiana Cuts June Allowable, Blames Imports 87
Slim-Hole Perforator Guns Prove Valuable Tool 88
Harris Bill Amended to Allow Some Field Price Controls 89
Lone Star Gas Asked for Reserves Data on New Project 91
Drillers Defy Canadian Muskeg from Man-Made Island 92
Record Toppled in Bidding for Offshore Lease 94
Tidelands Exploration Nets Three New Fields 95
Leasing of State Lands in Montana Delayed Again 96
New Sicilian Field Sparks Intensive Drilling Program 98
Expansion of Middle East Crude System Planned 98
Puerto Rico's First Refinery Goes On Stream 99
Production Rising at Fields in Sinai Peninsula 99
Creole Plans New Gas-Injection Plant in Venezuela 100
Austria Regains Oil Fields Captured During War 100

EXPLORATION FEATURES

Among the Drilling Contractors 145
Hugoton—a Stratigraphic Jungle 169
What's Ahead for Geophysics? 170
Exploration Highlights 174

DEPARTMENTS

They Say 61
Calendar of Events 69
Journally Speaking 73
Editorial 75
This Week 77
Watching Washington 90
International News 98
Pipeline Patrol 141
Equipment Digest 153
Trade Literature 160
Equipment Men in News 164
Personals 203
Deaths in the Industry 205
Statistical Summary 206
Drilling Statistics 207
Supply Statistics 208
Refining Statistics 209
Demand Statistics 210
Classified Advertising 211
Advertisers' Index 215

OIL AND GAS PIPELINES • REFINING • PETROCHEMICALS
EXPLORATION • DRILLING • PRODUCTION • FIELD PROCESSING

. . . an integrated magazine serving an integrated industry

TECHNOLOGY—OPERATION

What's Ahead in Rig Design 102

By R. L. Walker

This is first of two articles on trends and thoughts in drilling-rig design. There are three basic designs which feature flexibility, balance, and portability. There are drilling situations which dictate the use of the three in turn. Rig use and design are discussed in light of these drilling conditions.

Gas Testers Receive N.G.A.A. Awards 106

How Richfield Tackled Hydrogen Blistering 107

By B. W. Neumaier and C. M. Schillmoller

Richfield Oil Corp. is preventing hydrogen attack at its new Wilmington, Calif., fluid unit. Most acidic compounds are removed early in the process stream. Diethanolamine absorption and extensive water washing are used. Caustic washing and feed dehydration are also employed. Facilities are available for adding polysulfide and inhibitor when they are needed.

Building the Refinery for Minimum Maintenance 111

By R. E. Redfield

The refinery-maintenance expenditure can be minimized if (1) high-quality materials and equipment are used and properly installed, (2) equipment is properly sized, (3) least possible number of pieces of equipment are installed, (4) maximum standardization is used, and (5) there are built-in provisions for specific maintenance problem.

Improving Distillate Fuels by Hydrofining 113

By J. W. Zimmerschied, R. A. Hunt, Jr., and W. A. Wilson

Hydrofining a high-sulfur distillate from West Texas crude oil improves its quality to that of Mid-Continent distillate with no loss in liquid products. Desulfurization is essentially complete, the product is sweet, and objectionable odor is eliminated.

Scatter Propagation . . . New Radio Tool for Pipelines 117

By I. H. Gerks

With scatter propagation, communication lengths of as high as 1,000 miles are possible without relay stations. Operating frequencies are in the very-high-frequency and the ultra-high-frequency bands. Scatter won't replace microwaves but will be used in special cases.

Humble's Versatile Workover Truck 121

Research engineers of Humble Oil & Refining Co. have developed a mobile unit that can perform all the service truck operations required for working over any permanent-completion-type oil or gas well. The unit has proved highly successful in field test.

Selecting Wells for Production Stimulation 126

By R. E. Gladfelter, G. W. Tracy, and L. E. Wilsey

Here is a new method of analyzing producing rate and pressure buildup data. This permits direct measurement of low well productivity. When this is known it is possible to determine whether stimulation is needed and the result to be expected from these treatments.

Pipeline Patrol: Automatic Fire Protection 141

By E. E. Taylor and L. J. Fast

Automatic fire-protection systems have been installed in two gas-turbine stations in the desert west of Blythe, Calif. The system includes automatic shutdown devices and a water-spray fire system.

REGULAR FEATURES

Engineering Reference Section 133-139
Modern Drilling 133
Foreman's Page 134
Engineering Fundamentals 135
Questions on Technology 137
Field Processing 138
Instruments 139

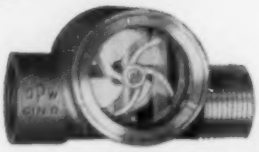
Takes ONE LOOK to Really Know . . .

with

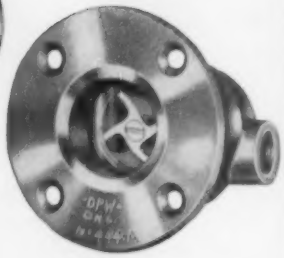
OPW

VISI-FLO

No. 45

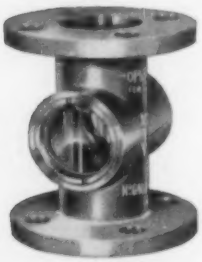


No. 44

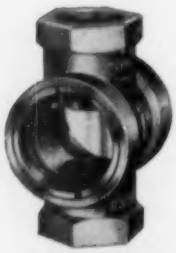


No. 444-A

No. 444

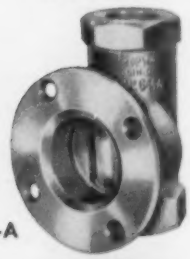


No. 640-F

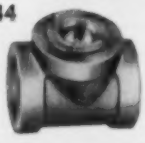


No. 640

No. 644



No. 644-A



No. 344

No. 1944

It's important to know at all times—what's going on . . . as well as what's going through !

You'll find OPW "VISI-FLO" Sight Glass Indicators a trustworthy visible means of alerting you as to rate of flow, viscosity, color of liquids, clarity and purity of product.

Whether it's entrained solids, gasoline, oil, water or even orange juice . . . "VISI-FLO" accurately shows you . . . helps you to insure protection against line stoppage . . . helps maintain uniformity, a high standard of product quality, and an even continuity of production.

From plain type to magnetic indicating type, the complete "VISI-FLO" line represents every application possible—vertical, horizontal, screwed end, flange type, with or without propeller. Manufactured in types for application to exposed pipes or for predesigned liquid channels incorporated in the machine.

Contact your oil equipment jobber for specific recommendations or Write for Bulletin F-6

OPW CORPORATION FOR HANDLING HAZARDOUS LIQUIDS
OPW
VALVES • FITTINGS • ASSEMBLIES
CINCINNATI 25, OHIO

OPW CORPORATION

2731 Colerain Ave. • Cincinnati 25, Ohio

Air Casualties

It's bad air that does it. But you can step up production by putting a Coppus Blower on the job to keep the air moving — and keep the men cool.

The kind of air a man works in has a lot to do with how much work he can turn out.

In confined places like shipholds or tanks or drums or boilers . . . or wherever the air is stagnant or hot or full of fumes . . . a Coppus Blower is a *must* for getting first-class work out of the men, all the time.

A Coppus Blower or Exhauster helps avoid sickness and lassitude due to bad air . . . and improves morale, too.

Portable and adaptable for special purposes, Coppus Blowers and Exhausters will have dozens of uses around your plant. The "Blue Ribbon" (a blue painted band) is your assurance of quality performance at lowest cost.

CABLE MANHOLE AND TANK VENTILATORS — BOILER MANHOLE BLOWERS AND EXHAUSTERS — HEAT KILLERS — SHIPHOLD VENTILATORS . . . DESIGNED FOR YOUR INDUSTRY — ENGINEERED FOR YOU

MAIL THIS COUPON To Coppus Engineering Corp., 266 Park Avenue, Worcester 2, Mass. Sales offices in THOMAS' REGISTER. Other "Blue Ribbon" Products in BEST'S SAFETY DIRECTORY.

PLEASE SEND ME INFORMATION ON SUPPLYING FRESH AIR TO MEN WORKING:

- ☐ in tanks, tank cars, drums, etc.
- ☐ in underground cable manholes.
- ☐ in aeroplane fuselages, wings, etc.
- ☐ on coke ovens.
- ☐ on steam-heated rubber processes.
- ☐ on boiler repair jobs.

COOLING:

- ☐ motors, generators, switchboards.
- ☐ wires and sheets.
- ☐ general man cooling.
- ☐ around cracking stills.
- ☐ exhausting welding fumes.
- ☐ stirring up stagnant air wherever men are working or material is drying.
- ☐ drying of walls, sheets, etc., after treated with coating material.

NAME .....

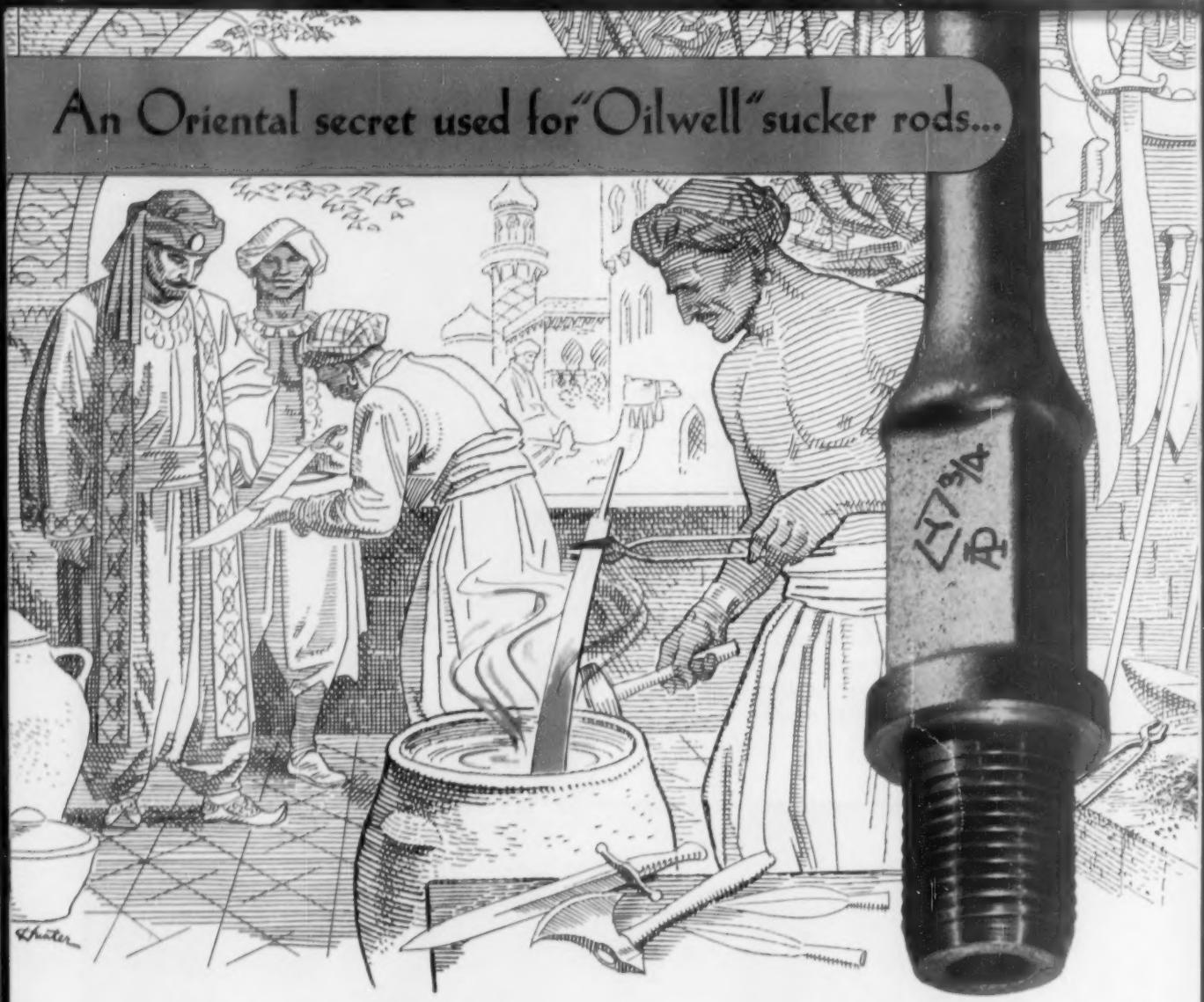
COMPANY .....

ADDRESS .....

CITY .....

(Write here any special ventilating problem you may have.)

An Oriental secret used for "Oilwell" sucker rods...



LIQUID QUENCHING makes steel STRONGER!

SWORDS OF DAMASCUS were prized throughout the East for their ability to retain a sharp cutting edge and for their great strength, as well as their excellence of finish. Damascus sword-makers had discovered the magical steel re-forming properties of liquid quenching and used this secret to give outstanding merit to their handiwork.

Now this time-proved principle, with all the modern refinements which metallurgical science has devised, is used by "Oilwell" to give maximum strength, and resistance to fatigue to three grades of sucker rods—"T," "W," and "Y"—because only liquid quenching can capture the fine grain structure and optimum properties of the alloy steels used in these rods. No slower cooling method can impart the multiple properties demanded by so many deep well pumping applications of today.

These three rod grades differ in chemical composition and consequently in their characteristics and properties. For example, "W" rods have the greatest strength but "T" rods have greater resistance to H_2S corrosion and "Y" rods have superior fatigue characteristics at low cost when corrosive conditions are not present. Yet this additional heat-treating step improves the performance of each grade.

● *Specific service applications for all rod grades are shown in a Sucker Rod Comparison Chart which you may have for the asking. You pay no more for "Oilwell" liquid-quenched sucker rods than for non-quenched competitive grades . . . but get extra protection and longer service.*

OIL WELL SUPPLY
DIVISION
UNITED STATES STEEL CORPORATION

Executive Offices—DALLAS, TEXAS
Export Office—
30 ROCKEFELLER PLAZA
NEW YORK 20, N. Y.

Area Offices — CALGARY, CANADA
CASPER, WYOMING . . . COLUMBUS, O.
DALLAS, TEXAS . . . HOUSTON, TEXAS
TULSA, OKLA. . . . LOS ANGELES, CALIF.

Branches Serving All Oil Fields

USS

"OILWELL"

TRADE MARK

UNITED STATES STEEL

The compact, new American Stubby Pumping Unit.

New American Stubby Pumping Units lower installation costs

The short base on the compact new American Stubby Pumping Unit can be adapted to pumping jack foundations where old equipment is being replaced with electrically operated equipment.

On new wells where foundations must be constructed, much less area is needed. This is particularly important when the unit must be elevated because of water conditions.

The compact arrangement of the Stubby Unit requires shorter drive belts and also raises the motor up out of the sand, snow, and grit. The new Stubby is another great American pumping unit that will give you *more service with less servicing.*

Whether you are replacing pumping jacks or putting a new well on a pump, check the new Stubby Pumping Unit—you'll find it costs less to pump with an AMERICAN. Try it!

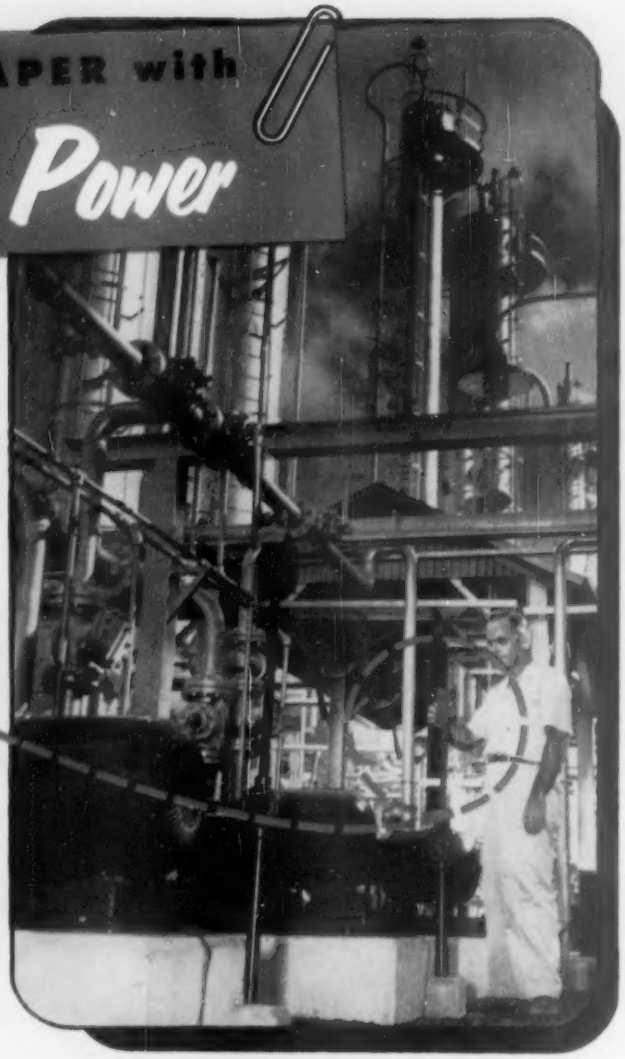
For further information, contact your favorite supply store or nearest American office.

AMERICAN MANUFACTURING COMPANY OF TEXAS AMCOT

P. O. BOX 7037 • FORT WORTH

Odessa • Tulsa • Kilgore • Wichita Falls • Houston • Shreveport • New York • Casper • Wichita • Calgary

You can do it CHEAPER with UTILITY *Electric Power*

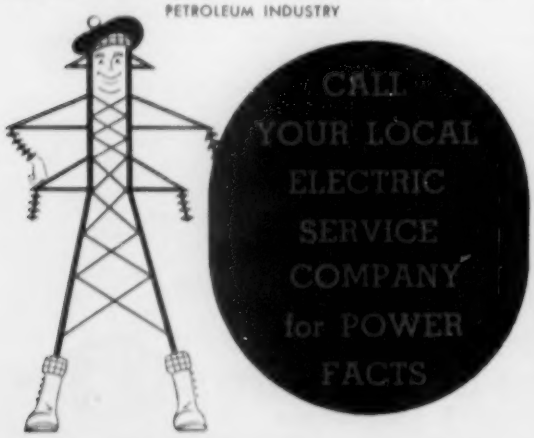


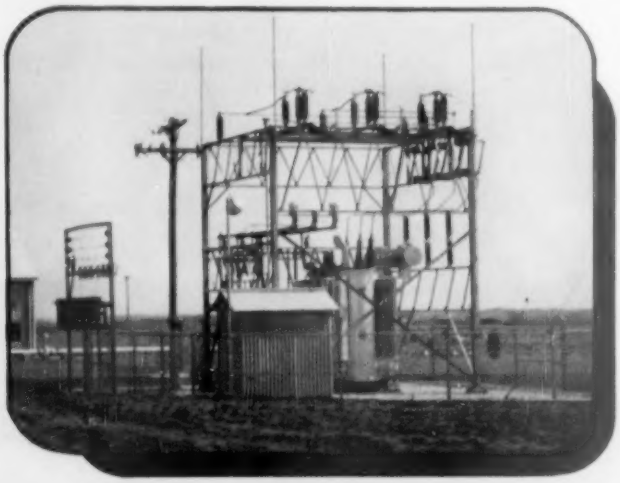
Low Cost Power!

Utility Electric Power gives you just that . . . PLUS MORE! Wherever oil is lifted, moved, or refined, Utility Electric Power will do a great job! Low initial cost . . . low maintenance and operating costs . . . complete dependability around the clock . . . safety, convenience and automatic control to meet your power requirements. Yes, these advantages are yours when **Economical** Utility Electric Power is specified.

Petroleum Electric Power Association

P. O. BOX 2771, DALLAS, TEXAS
ORGANIZED IN THE INTEREST OF GREATER SERVICE TO THE PETROLEUM INDUSTRY

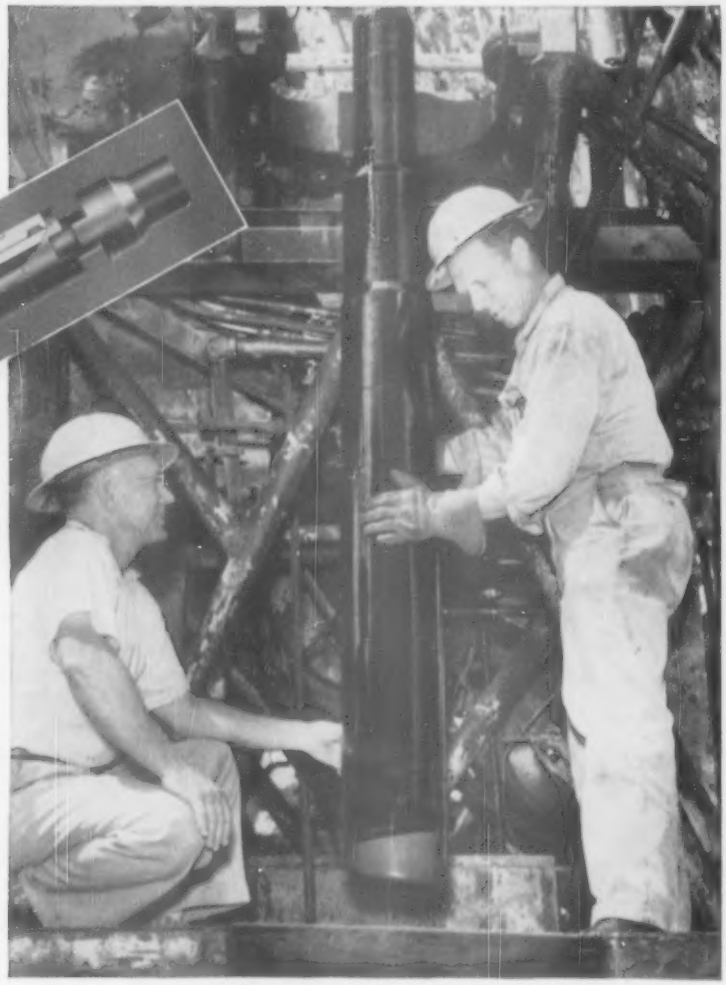




Another development using

B. F. Goodrich Chemical *raw materials*

Hycar helps drillers hook fish



Overshot manufactured by Houston Oil Field Materials Company, Houston, Texas; Hycar rubber parts supplied by Murray Rubber Company, Houston, Texas.

WITH this new overshot on the end of his string, the driller makes short work of even the toughest fishing job on pipe which sometimes breaks in the hole. One reason is the exceptional ruggedness of the pack-offs, made of Hycar American rubber.

Engineers who developed this unique fishing tool—a circulating and jack screw releasing overshot—ran extensive tests on many types of rubber to find the best one for the important pack-off job. They wanted one that could withstand the abrasives, contact with hydrocarbons, high temperatures, the terrific pressures and stresses encountered in oil field operations.

Hycar passed the lab tests with ease, proved them under actual operating conditions. Hycar performs equally well in many other oil-field jobs, on bridge plugs and blowout preventers, on mud pumps, packers, and pipe-line valves. It can be molded, extruded, shaped to precise dimensions for countless uses.

The unusual versatility and outstanding physical properties of Hycar make it first choice of designers in many industries. It may supply the right answer to one or several of your own problems. For complete information, please write Dept. CG-6, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

B. F. Goodrich Chemical Company
A Division of The B. F. Goodrich Company

Hycar
American Rubber

GEON polyvinyl materials • **HYCAR** American rubber and latex • **GOOD-RITE** chemicals and plasticizers • **HARMON** colors

Hydreco Gear Type Pump and Dudco Dual Vane Fluid Motor.

Petroleum Production Moves Forward with Power

FLUID POWER

DUDCO DIVISION
Hazel Park, Mich.
Dual-Vane Hydraulic Pumps, 3 to 120 gpm; Fluid Motors, 7 to 140 hp; 2000 psi operation. Piston-Type Pumps for 5000 psi.

HYDRECO DIVISION
Cleveland, Ohio
Gear-Type Hydraulic Pumps, 3 to 120 gpm; Fluid Motors, 3 to 52 hp; Cylinders; Control and Auxiliary Valves; 1500 psi.

WATERTOWN DIVISION
Watertown, N. Y.
Railroad air brake valves for freight and passenger equipment, STRATOPOWER Hydraulic Pumps for Aircraft, to 3000 psi.

KINNEY MANUFACTURING DIVISION
Boston, Mass.
Rotating Plunger and Heliquad Liquid Handling Pumps, to 3000 gpm. Vacuum Pumps, 0.2 micron, evacuate 1800 cfm.

AURORA PUMP DIVISION
Aurora, Ill.
Liquid Handling Pumps, Centrifugals and deep well Turbines, 7000 gpm, 500 ft. heads. Turbine-type, 150 gpm, 600 ft. heads. Condensate Return Units.

Time schedules for modern exploration, drilling, production and pipe line operation leave no room for equipment that does not best combine Safety, Flexibility, Speed and Economy. Thus, Fluid Power gets the call to provide thrust or rotary motion for drill rigs, rotary tables and winches . . . for drives and controls on portable equipment and vehicles . . . for power to drive pumps, generators, mixers and actuate valves along pipe lines.

The DUDCO and HYDRECO Divisions of The New York Air Brake Company produce components for improved hydraulic circuits for all types of field and production equipment. For 1000/1500 psi operation, the HYDRECO Division furnishes Gear Type Pumps and Motors as well as Control and Auxiliary Valves and Hydraulic Cylinders.

The DUDCO Division provides Dual-Vane Pumps and Motors for 2000 psi circuits and 5000 psi Variable Delivery Pumps for special high pressure applications.

In addition to this advanced type Hydraulic equipment, The New York Air Brake Company contributes a broad range of liquid Handling Pumps and world-famous Kinney High Vacuum Pumps to Petroleum production. Here, for the oil man to choose, are Aurora Turbine and Centrifugal Pumps and Kinney Heliquad Gear and Rotating Plunger Pumps . . . equipment to solve the problems of "pumping any substance that will flow through a pipe." And, for de-aerating, dehydration, vacuum distillation, refrigeration and other petro-chemical processes . . . Kinney Vacuum Pumps.

Bring your file of information up to date on new developments in hydraulic, liquid handling and vacuum equipment. Write for catalogs today!

THE NEW YORK AIR BRAKE COMPANY

230 PARK AVENUE • NEW YORK 17, N. Y.

INTERNATIONAL SALES OFFICE, 90 WEST ST., NEW YORK 6, N. Y.

UNDERCOVER AGENTS AT WORK

Dependable protection against underground corrosion is one of the most essential considerations in the installation of any pipeline. This protection usually consists of an insulating, corrosion-inhibiting coating applied to the pipe surface, with further shielding provided by a wrapper to resist abrasion and soil stress. These are the "undercover agents" that safeguard pipeline installations against corrosion leaks and deterioration.

Throughout the nation today, leading utilities and pipeline companies look to Dearborn for long-term protection of one of their most important investments—the carrier pipe that must transmit material thousands of miles to its consumer. Dearborn's NO-OX-ID Coatings and NO-OX-IDized Wrappers provide chemical and mechanical protection against moisture penetration and soil action—protection that lasts for decades—on installations under ground or under water.

Whether applied by hand . . . by Traveliner . . . or at the mill, Dearborn Coating Combinations are your best assurance of dependable, long-life protection. On your next pipe-coating job, you'll find it pays to specify Dearborn NO-OX-ID.

Dearborn NO-OX-ID®

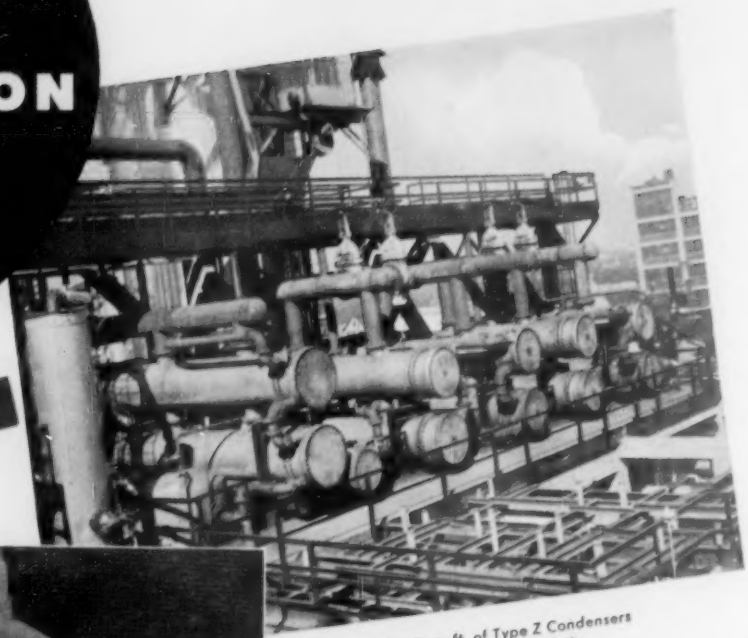
For Long-Term Pipeline Protection

DEARBORN CHEMICAL COMPANY
Merchandise Mart Plaza, Dept. OG, Chicago 54, Ill.
Please send me complete information about NO-OX-ID.

Name.....*Title*.....
Company.....
Address.....
City.....*Zone*.....*State*.....

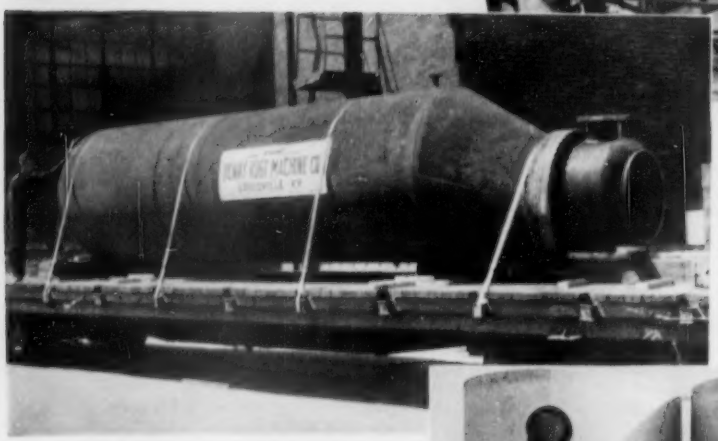
Better DESIGN
Better CONSTRUCTION
Better VALUE

ALL YOURS



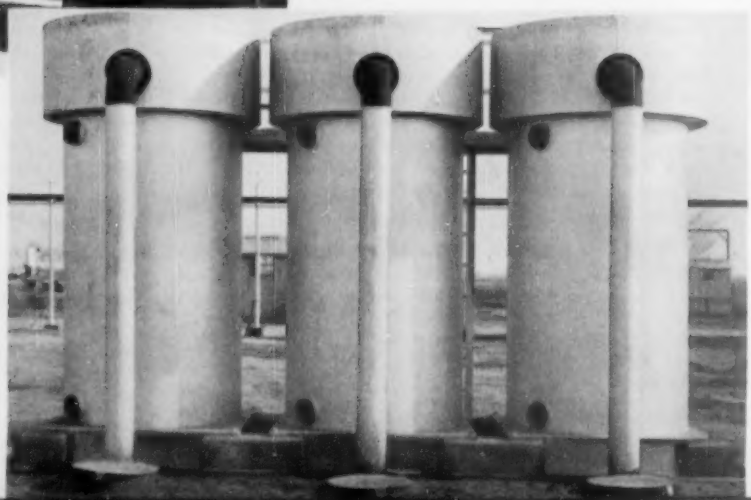
30,000 sq. ft. of Type Z Condensers in a modern catalytic refinery installation.

PETROLEUM REFINERIES



A Type KW Reactivator Reboiler for a Texas chemical plant.

CHEMICAL PLANTS



Three Type A Jacket Water Coolers which serve engines totaling 7300 horse power. Muddy well water is the cooling medium.

POWER PLANTS

Vogt FOR BETTER HEAT EXCHANGERS

HENRY VOGT MACHINE CO., LOUISVILLE, KY.

when you specify..

HEAT TRANSFER EQUIPMENT

by Vogt

Many years of unmatched experience gained from solving the heat transfer problems of diversified industrial plants has given Vogt a priceless wealth of engineering "know-how."

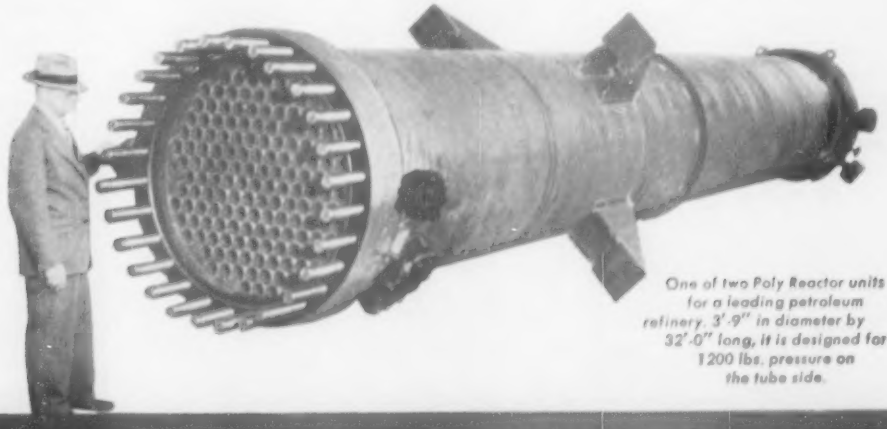
When you specify Vogt Heat Transfer Equipment you are SURE of . . .

(1) BETTER DESIGN . . . because Vogt engineers carefully weigh and evaluate the conditions peculiar to the specific service for each individual application. Thereby the correct proportioning of heat transfer surfaces and arrangement of baffles is determined and the proper materials selected for the unit. Exchangers have been designed for temperatures as low as minus 160°F. and as high as 1600°F., and pressures ranging from vacuum to 9500 pounds per square inch.

(2) BETTER CONSTRUCTION . . . because Vogt has the most modern facilities with which to form, machine, weld, X-ray, and stress relieve; all manned by skilled operating personnel. Tubes are always properly supported to prevent excessive deflection and baffles are accurately aligned and fitted to facilitate ease of tube replacement or removal of bundles from shells.

(3) BETTER VALUE . . . because of savings which accrue from better design and better construction. Correct design insures maximum heat transfer and minimum fouling, to substantially cut operating costs. Better construction assures low maintenance expense because of proper materials selection and fabrication techniques. This insures resistance to corrosion and leakage whereby down time for cleaning and repairs is reduced to a minimum. *Vogt Heat transfer units are fabricated from carbon and stainless steels, Monel, nickel, Inconel, silicon bronze, aluminum and other non-ferrous materials. Plastic materials are used when required to meet special problems.*

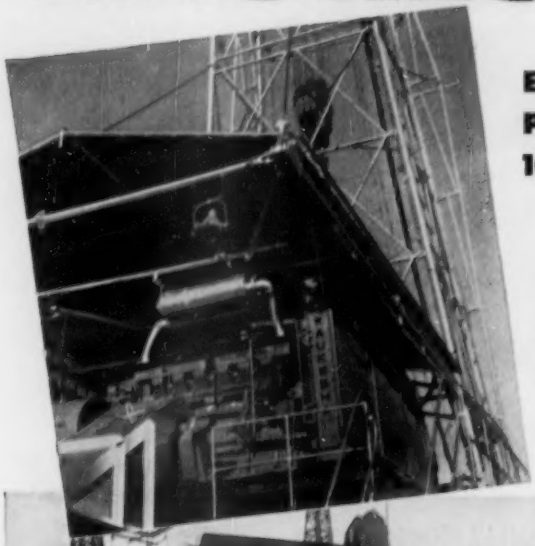
Write for Bulletin HE-6



One of two Poly Reactor units for a leading petroleum refinery. 3'-9" in diameter by 32'-0" long, it is designed for 1200 lbs. pressure on the tube side.

BRANCH OFFICES: NEW YORK, CHICAGO, CLEVELAND, DALLAS, PHILADELPHIA, ST. LOUIS, CHARLESTON, W. VA.

World's Finest Oil Field Power
WAUKESHA



ENGINES and POWER UNITS 10 hp. to 1135 hp.

Send for

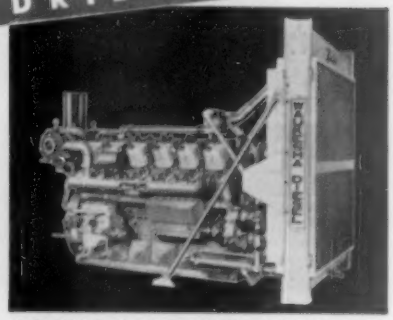
BULLETIN 1079

It gives complete line of Waukesha Oil Field Engines for gas, gasoline, normal Diesel, or turbocharged Diesel operation—to 1135 hp.

WAUKESHA MOTOR COMPANY
WAUKESHA, WISCONSIN
New York • Tulsa
Los Angeles

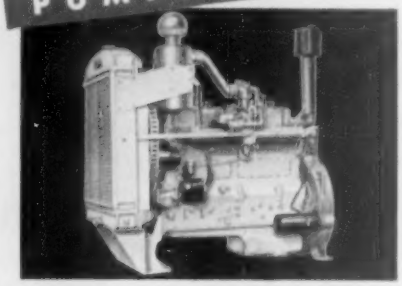
253-R

DRILLING



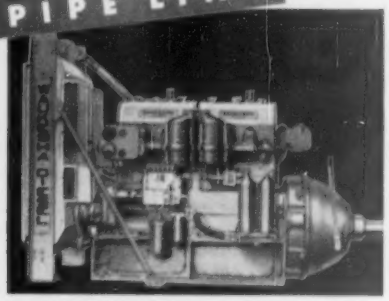
VLRDBSU Turbocharged Diesel Unit—twelve cyl., 8½-in. bore x 8½-in. stroke, 5788 cu. in. displacement, 1100 hp at 1200 rpm, maximum.

PUMPING



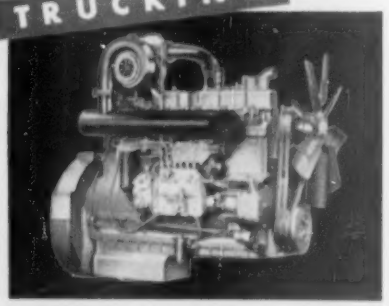
145-GZBU Gas Power Unit—six cylinders, 5⅜-in. bore x 6-in. stroke, 817 cu. in. displacement, 176 hp at 2000 rpm on natural gas.

PIPE LINE

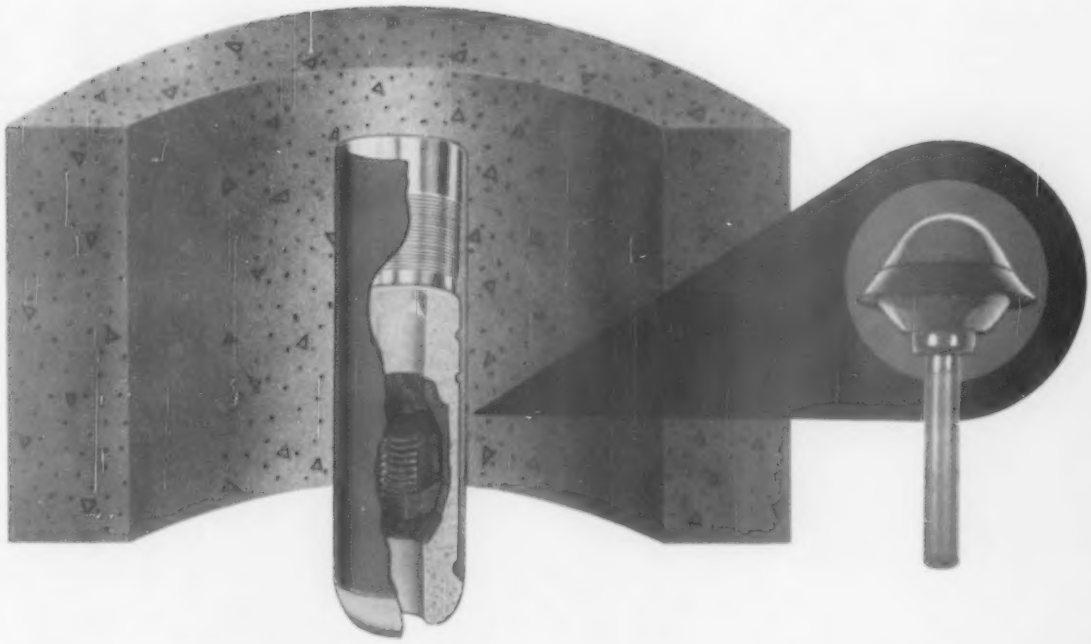


NKDBU Normal Diesel Power Unit—six cylinders, 7-in. bore x 8¼-in. stroke, 1905 cu. in. displacement, 274 hp at 1200 rpm, maximum.

TRUCKING



148-DKBS Turbocharged Truck Diesel—six cylinders, 5¼-in. bore x 6-in. stroke, 779 cu. in. displacement, 280 hp at 2100 rpm.



PROTECTS CEMENTING WITH A *SUPER SEAL*

HALLIBURTON'S *PROVED* FLOATING EQUIPMENT

On tough cementing jobs, where pressures are high and wear is severe, you can expect to see Super Seal Floating Equipment being used almost exclusively. With a new valve design that tests higher and with unmatched resistance to abrasion, Halliburton's Super Seal equipment has consistently given leakproof, wearproof protection for every kind of cementing job.

During 12 years of lab and field tests, Halliburton engineers proved the efficiency of a new conical valve that eliminates the major weakness of a ball type valve. The Super Seal valve makes a wide band contact with its seat—not a line contact with concentrated stress—which distributes pressure and prevents damaging wear. A special lip ring of oil resistant rubber is used to give a more positive and an instantaneous shut-off.

In one test, wear resistance was proved by pumping a 10.5# mud with 8% blow sand, viscosity 40 seconds, through the valve collar at a rate of 14 barrels a minute for 30 hours. Even this punishing abuse could not affect the perfect, leakproof shut-off of the Super Seal valve.

And you'll find other important improvements—faster drillability, unexcelled flow area, improved guide design—that have all been proved *before* being introduced. With a background of thorough testing, the Super Seal equipment has been able to provide successful service from the start on all cementing jobs—rugged or routine. For proved tools and more cementing help from the world's most experienced cementers, call your local or district office of the Halliburton Oil Well Cementing Company.

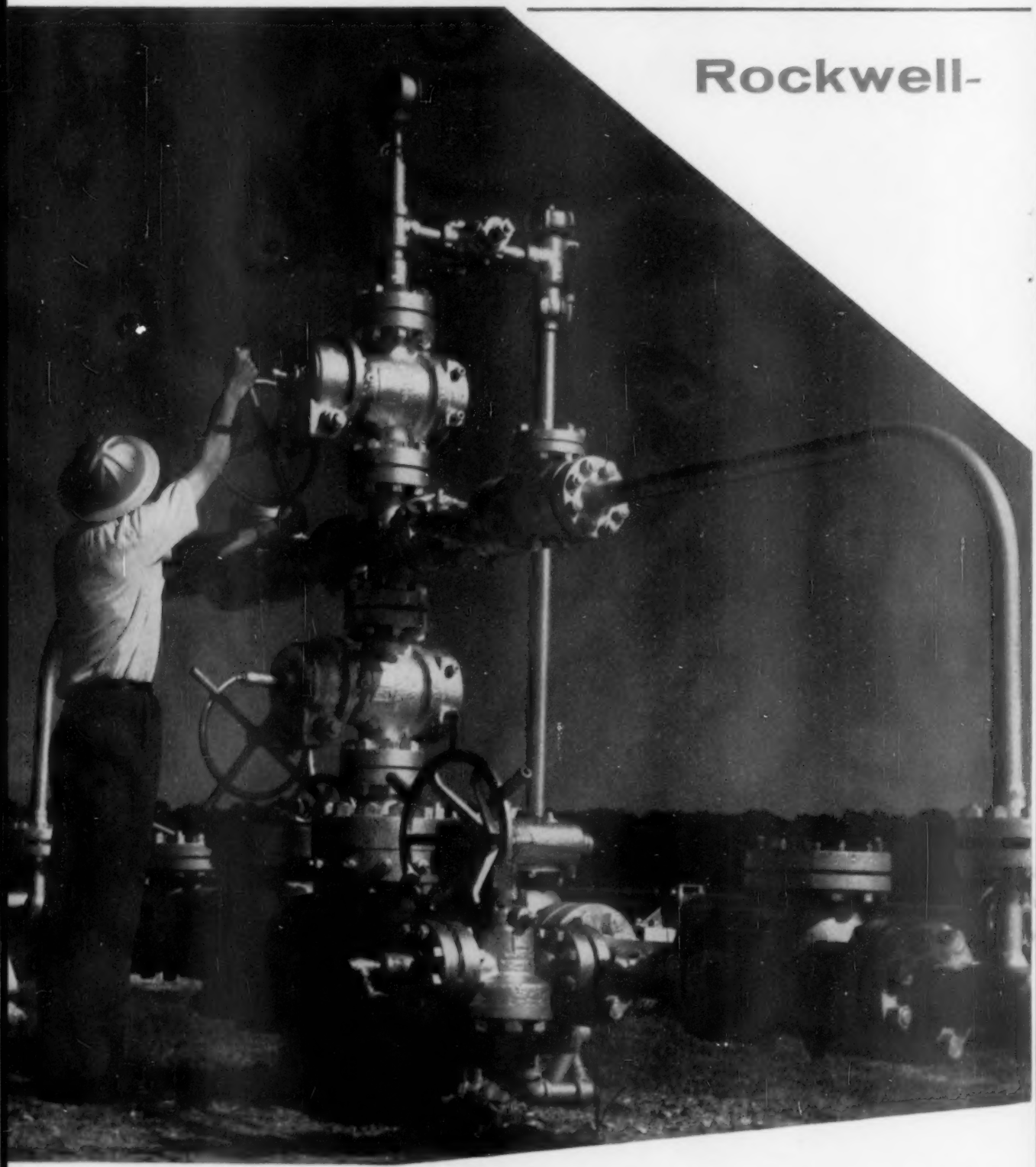
HALLIBURTON

CEMENTING EQUIPMENT

211 SERVICE CENTERS—JUST MINUTES AWAY FROM ANY RIG

ON ANY

Rockwell-



ROCKWELL-NORDSTROM

LUBRICANT SEALED FOR POSITIVE

CHRISTMAS TREE

Nordstrom **Valves**
Prove Best Under Pressure

In an emergency, you'll see quickly why Rockwell-Nordstrom valves are best for *any* well head service.

RELUBRICATE UNDER PRESSURE

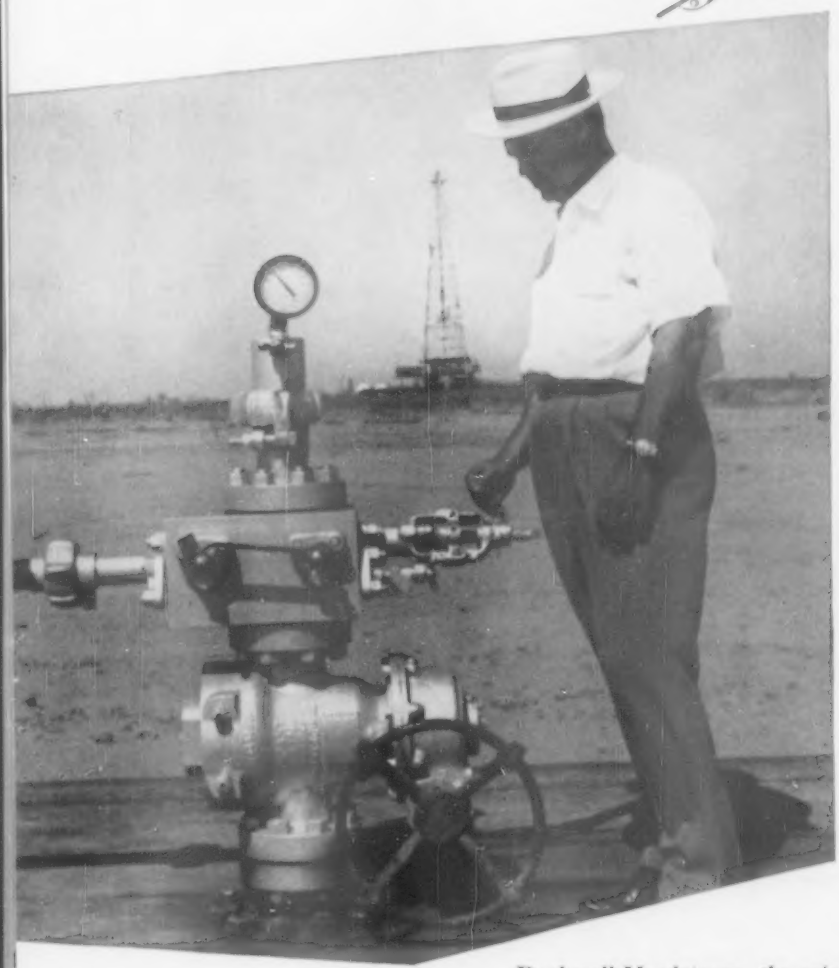
At any line pressure, Rockwell-Nordstrom valves can be relubricated as effectively as with no pressure. Injection of the lubricant builds hydraulic pressure within the valve to any degree required so that the plug is thoroughly lubricated and the jacking chamber is sufficiently pressurized to permit easy quarter-turn operation.

REPACK UNDER PRESSURE

The Rockwell-Nordstrom *Hypreseal* is the only valve that can be repacked under any line pressure and in any position. This eliminates shut down because the stem packing is applied through check valves.

ADJUST UNDER PRESSURE

All Rockwell-Nordstrom valves are adjustable in the field on trees under operating pressure. They are the *only* type of valve that can be fully adjusted in service. The plug can be *instantly* jacked on its seat of lubricant by a few turns of the lubricant fitting or by injections with a lube gun . . . stuck, jammed or galled valve problems are eliminated.



Rockwell-Nordstrom, *the original* lubricated plug valve, is available in a complete line of sizes and pressure-temperature ratings. Whatever your Christmas tree requirements, there is a Rockwell-Nordstrom valve that will make your installation really permanent and trouble-free . . . and at lower cost. Write for complete details or see your supply house today. Rockwell Manufacturing Company, Pittsburgh 8, Pa.

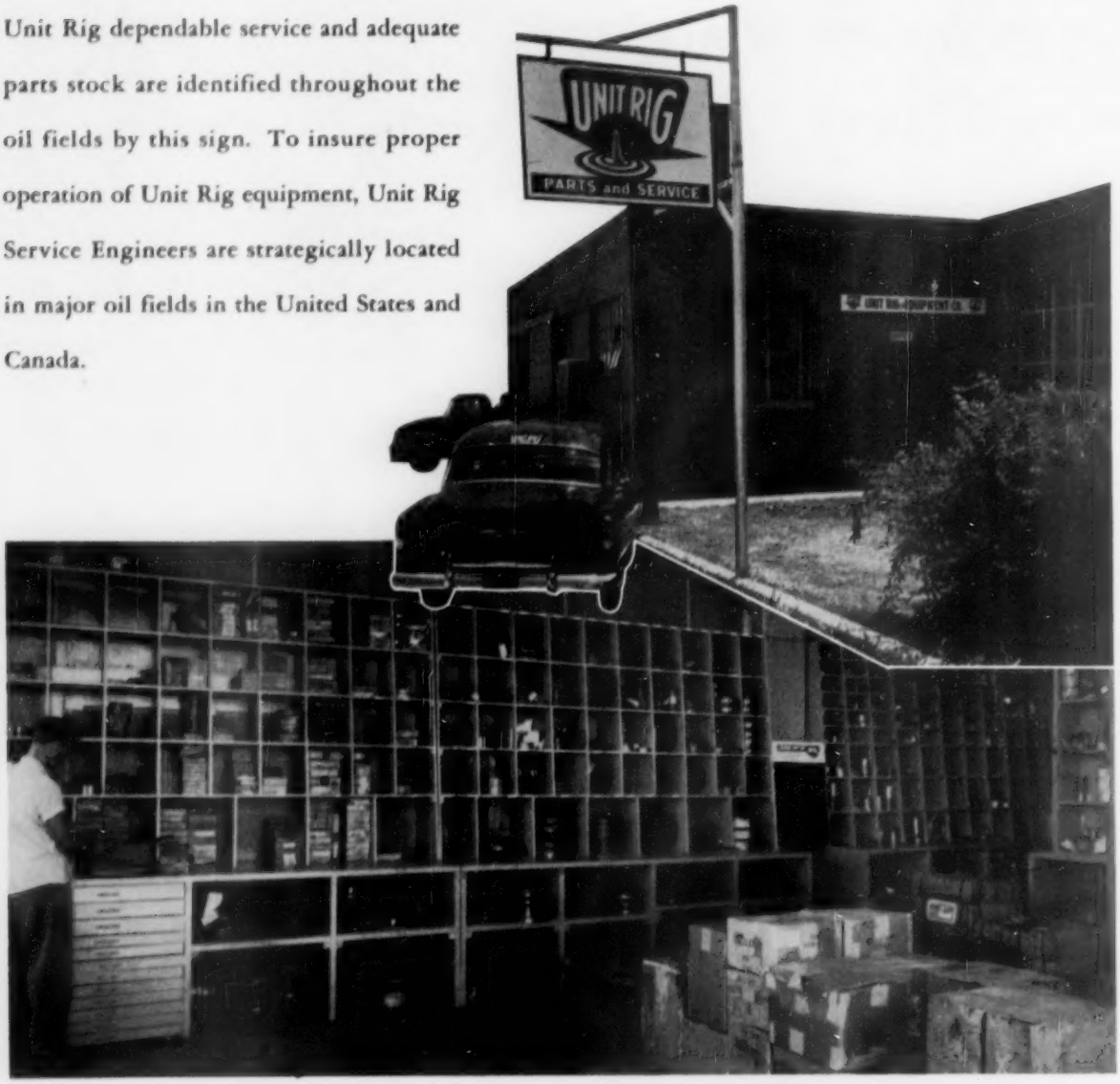
Canadian Valve Licensee: Peacock Brothers Limited

VALVES

SHUT-OFF

THE SIGN OF GOOD SERVICE

Unit Rig dependable service and adequate parts stock are identified throughout the oil fields by this sign. To insure proper operation of Unit Rig equipment, Unit Rig Service Engineers are strategically located in major oil fields in the United States and Canada.

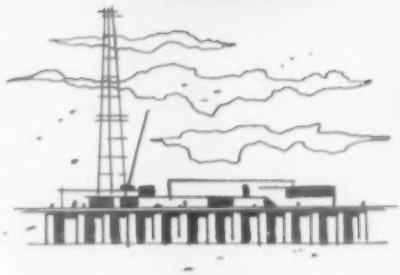


UNIT RIG PRODUCTS ARE SOLD THROUGH LEADING SUPPLY COMPANIES THROUGHOUT THE U.S.A. AND CANADA

EXPORT SALES — Mid-Continent Supply Company, 45 Rockefeller Plaza
New York 20, New York • Cable — MIDUNITRIG

UNIT RIG & EQUIPMENT CO. TULSA, OKLAHOMA, U.S.A.

first OFFSHORE STRUCTURE AND STILL best



The FIRST all steel offshore drilling platform in the Gulf of Mexico was designed and built by the W. Horace Williams Co., Inc., off Grand Isle, Louisiana, in 1947—and, is the LARGEST platform in the Gulf.

Over 30 other platforms have been designed and built by the W. Horace Williams Co., Inc., and designs are now completed for **water depths up to 200 feet.**

For the best in engineering and construction contact

W. HORACE WILLIAMS COMPANY

ENGINEERS INCORPORATED GENERAL CONTRACTORS

833 Howard Ave. **Ph. RAymond 1291**

Marine Contractors Since 1908
NEW ORLEANS

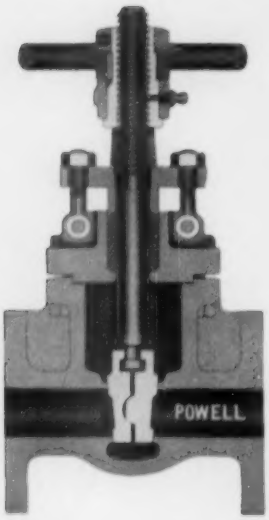
OFFSHORE STRUCTURES, WHARVES, BULKHEADS, FOUNDATIONS

POWELL VALVES . . . THE COMPLETE QUALITY LINE . . . POWELL VALVES

. . . THE COMPLETE QUALITY LINE . . . POWELL VALVES . . . THE COMPLETE QUALITY LINE . . .

. . . THE COMPLETE QUALITY LINE . . . POWELL VALVES . . . THE COMPLETE QUALITY LINE . . .

Preferred for Precision and Performance



Powell Valves are the choice of engineers because they know every valve is precision made, meeting every specification—every time.

And there are other good reasons why engineers prefer Powell Valves—because Powell Valves are dependable . . . economical . . . and Powell has the COMPLETE quality line of valves.

Consult your Powell Valve distributor. If none is near you, we'll be pleased to tell you about our complete line, and help solve any flow control problem you may have.

The Wm. Powell Company
Cincinnati 22, Ohio...109th year

FIG. 2495 (Sectional)—Stainless Steel O. S. & Y. Gate Valve for 150 Pounds W. P. Double Wedge Disc is accurately guided to seat.

FIG. 375—Bronze Gate Valve for 200 Pounds W. S. P.

FIG. 2309—(Sectional)—Flush Bottom Tank Outlet Valve for 150 Pounds W. P. Disc Opens Into Tank.

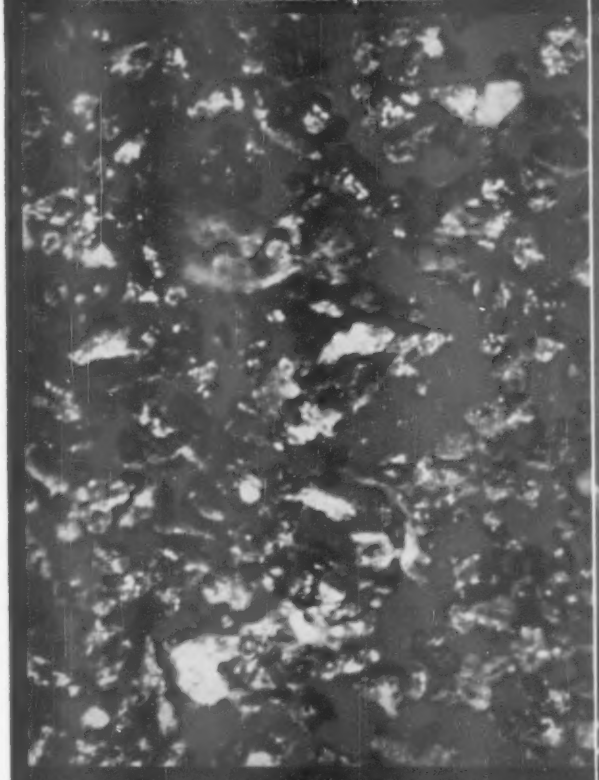
FIG. 2193—Large Ni-Resist* Gate Valve for 200 Pounds W. O. G.

*Trade-mark of The International Nickel Co.

POWELL VALVES

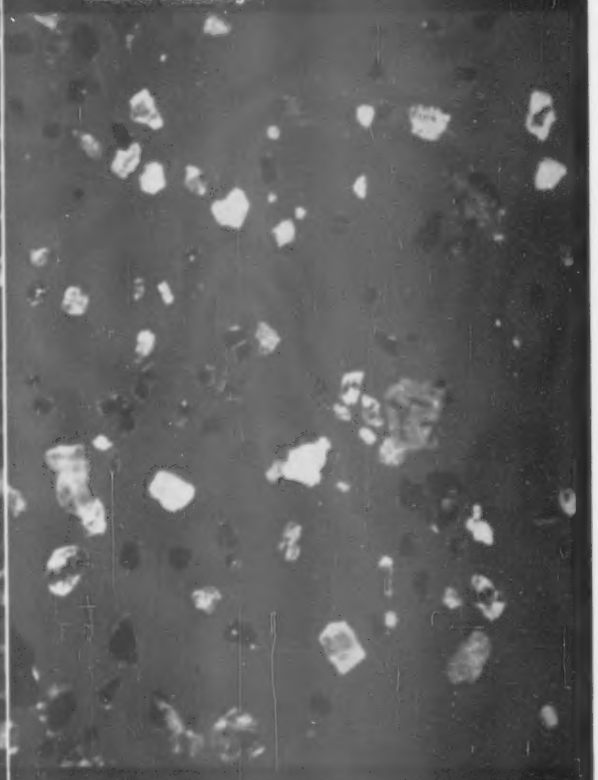
quantitative and qualitative PROOF

1. That "clean," ready-to-refine crude oil often contains harmful solids in substantial quantities.



The photomicrograph above (70X) shows the solids, or sediment, contained in about one half quart of supposedly "clean" refinery charging stock.

2. That they are effectively removed by PETRECO Electric Desalting.



This photomicrograph (also 70X) shows the sediment remaining in the same quantity of oil after it had been purified by Petreco Electric Desalting.

The removal of harmful solids from charging stock is an additional benefit derived from the use of Petreco desalting. In addition to removing 95% to 100% of the salts, Petreco desalting also insures against plugging and abrasion damage from solids such as those illustrated above. Along with the salts, these detrimental substances are brought together in the electric field, caused to associate with the water phase and are eliminated in the effluent water.

For maximum refining efficiency, specify Petreco Electric Desalting. Complete information is available from

PETRECO — A DIVISION OF PETROLITE CORPORATION

3202 South Wayside Drive, Houston 1, Texas
1390 East Burnett Street, Long Beach 7, California

PETRECO®

Specialized Electric Petroleum Processing

DEHYDRATING • LUBE OIL TREATING • DISTILLATE TREATING
DESALTING • SEDIMENT SEPARATION • DESAPONIFICATION

DS-5

Hollow Cylindrical Forgings

in Many Sizes and Types

The forgings shown here are good examples of the many shapes made each year by Bethlehem's pierce-forging process. This is a method that speeds the production of hollow forgings in various sizes and types, and results in finished pieces of unusual ruggedness and strength.

If you require small or medium-weight parts that are hollow and are roughly cylindrical in shape, we'd like to explain the advantages of pierce-forging. Products made economically by this method include pump liners . . . commutator shells . . . journal forgings . . . nozzles . . . chambers for separator systems . . . and many other items of the same general nature.

They can be furnished in either carbon or alloy steel, untreated or heat-treated. The customer receives them nicely rough-machined, so that he can bypass this particular step in his own operations.

Check with us, won't you? There may be important ways in which these high-strength, low-cost forgings can help in your production program.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

★ BETHLEHEM STEEL ★

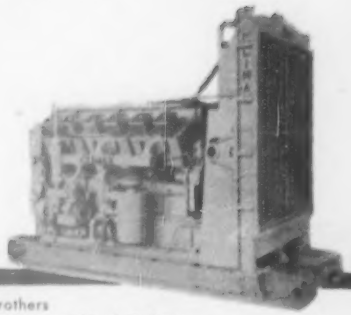
All your horses working -- All the time

No place in industry is dependable power of such importance as it is in the oil fields. Climax Blue Streak Engines are famous for rugged, dependable service under the most adverse conditions. They are on the job all the time and you know when your power is Climax that all your horsepower works for you all the time.

Climax has an engine for every oil field need. Call your nearby Climax Blue Streak distributor for complete information on dependable power.

WHERE POWER IS YOUR PROBLEM . . . CLIMAX IS THE ANSWER.

climax BLUE STREAK ENGINES



CLIMAX ENGINE AND PUMP MFG. CO.

208 SO. LA SALLE ST. CHICAGO 4, ILL.

FACTORY
CLINTON, IOWA

DISTRICT OFFICE
155 CONTINENTAL AVE.
DALLAS 7, TEXAS

DISTRIBUTORS

Drillers Machine Shop
Oklahoma City, Okla.

United Tool Co.
Shreveport & Alexandria, La.

Vern Walton Co.
Coolidge, Casa Grande & Marana, Ariz.

Wilson's Engine & Equipment Co.
Bakersfield & Long Beach, Calif.

Stewart & Stevenson Services, Inc.
Houston and 8 Texas Branches

Cullander Machinery Co.
Belzoni, Miss. & West Memphis, Ark.

Tobin Machinery Co.
Lafayette, La.

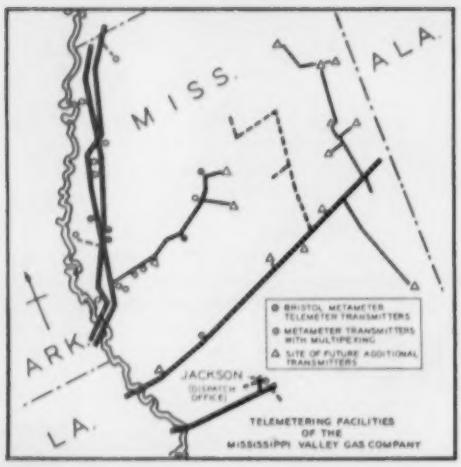
Sweeney Brothers
Williston and Fargo, North Dakota

Landes, Zachary and Peterson
Denver, Colo. Albuquerque, N. M.
Billings, Mont. Casper, Wyo.
El Paso, Texas Salt Lake City, Utah

WHAT'S NEW AT BRISTOL

NERVE CENTER. Central dispatching office of Valley Gas, where dispatcher John Bonner checks the readings of pressure, flow, and temperature at 49 points in the company's distribution system on Bristol Metameter Receivers.

New telemetering system checks 49 functions by phone!



104 COMMUNITIES in northern Mississippi are served by Valley Gas.

Mississippi Valley Gas Company uses Bristol Metameter* Telemeters in most extensive "Selective Calling" telemetering system

By simply dialing a code number on a standard telephone dial, a dispatcher can get a reading on a Bristol Metameter receiver of pressure, flow, or temperature from any one of 49 Metameter transmitters installed at 21 different field locations along Mississippi Valley's retail gas distribution system.

There are also Bristol Time-Multiplexing circuits installed at two communities. With these, the dispatcher can dial one code number and have seven readings from the community in question indicated at the same time on the panel board — thus reducing dialing time. The function and the location being received is indicated by a system of bullseye lights on the panel.

We'd like to tell you how Bristol Metameter Telemeters can help you, too. Write today for free 40-page booklet M1710. Address The Bristol Company, 120 Bristol Road, Waterbury 20, Conn. 4.39

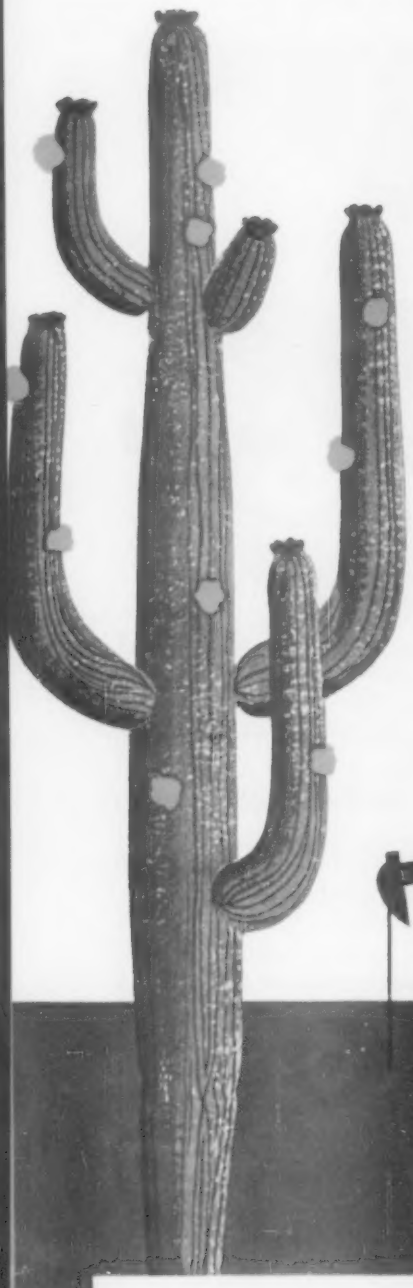
Reg. U.S. Pat. Office

TRADE MARK BRISTOL'S REG. U.S. PAT. OFFICE

BRISTOL

POINTS THE WAY IN HUMAN-ENGINEERED INSTRUMENTATION

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS



Block Buster!

ATPET 931 revives water-damaged wells

Water blocks which have cut off or reduced production are now being removed at low cost by the use of ATPET 931, a unique interfacial tension depressant made by Atlas Powder Company. A process* developed by Stanolind Oil & Gas Company makes use of this chemical to stimulate old wells, to restore dead wells, and to complete new wells that are subject to water damage.

This process consists of injecting field crude containing about 1% ATPET 931 into the oil formation. By reducing the interfacial tension between oil and water practically to zero, this new chemical breaks water blocks and permits oil flow through the strata.

Payout is fast. Amortization time is measured in days . . . instead of months. The process costs exceptionally little, and permits economical stimulation of many wells previously considered marginal.

*Pat. applied for

ATPET 931 is non-ionic; gives excellent performance in the presence of oil field waters and brines, and has little tendency to plate out on solid surfaces. Write your nearest Atlas office for samples and further information.

BOSTON, MASS.
405 Garden Building
250 Boylston Street
KEnmore 6-7817

CHICAGO, ILLINOIS
1605 Field Building
135 S. LaSalle Street
FRanklin 2-9530

HOUSTON, TEXAS
Suite 128
3272 Westheimer Rd.
JAckson 8-5561

LOS ANGELES, CALIF.
411 West Fifth Street
MIchigan 4-8896

NEW YORK, N. Y.
60 East 42nd Street
VAnderbilt 6-1730

ST. LOUIS, MO.
634 N. Grand Ave.
JEfferson 3-2538

SAN FRANCISCO, CALIF.
806 Crocker First National Bank Bldg.
1 Montgomery Street, GArfield 1-8640

CHEMICALS DEPARTMENT
ATLAS POWDER COMPANY
WILMINGTON 99, DELAWARE

ATLAS POWDER COMPANY, CANADA, LTD.
BRANTFORD, CANADA

Styled to attract the motorist . . .

NIGHT and

NEW

UNEXCELLED LIGHTING

Lights under integral modern canopy furnish brilliant illumination for dial face, entire front and back of dispenser and part of the island.

The new SMITHway Gasoline Dispenser offers you brilliant new beauty and proved *functional* performance...with styling in keeping with modern station design and ability to handle today's more powerful gasolines. Before you buy dispensers be sure to see the *NEW* SMITHway. Write for Bulletin 171.

Through research A.O. Smith SMITHway *. . . a better way*

A.O.Smith
CORPORATION
METER PRODUCTS

Factories: 5715 Smithway St., Los Angeles 22, Calif.; P. O. Box 500, Succasunna, N. J. Offices: Atlanta, Chicago 7, Houston 20, Los Angeles 22, New York 17. Canada: Toronto 12, Vancouver 1. International Division—Milwaukee 1, Wis.

DAY

Take a look at these OUTSTANDING FEATURES:

Better Visibility—Thanks to overhead lighting, computer numerals are not recessed. Instead, they are placed close to glass and are clearly visible even at extreme angles. Broad dial face is trimmed with stainless steel.

More Advertising Space—As much as 38% more space provided for advertising slogans and decals. And it's always under full illumination, right at point of purchase.

Self-Purging A. O. Smith PM-2 Meter—Remarkable A. O. Smith PM-2 Meter is doubly-guaranteed to give you years of service. First—a full 2-year guaranty. Second—a $15.00 replacement plan.

Dual Purpose Hood—The smartly styled hood not only conceals lights for this self-illuminated dispenser but also protects dial face against poor visibility in rainy or snowy weather.

Durable Scuff Plate—Large scuff plate is handsomely formed of stainless steel, stands up against nozzle banging and eliminates unsightly scratches and paint chipping.

Easy to Keep Clean—Bonderized, baked enamel finish—equal to that on highest-priced motor cars. Easy to keep clean with only normal care.

NEW

The new SMITHway Dispenser is only 57 inches high and its base measures 17" x 24". Connections and hold-down bolts are located on the same spacing as most conventional models, making change-over installations easy. It is equipped with an outside hose retractor for a 13-foot length of hose.

AN ENGINEER LOOKS AT
W-K-M VALVES

On Gamma Ray Inspection

Careful gamma-ray inspection by an expert will reveal the following defects in light or heavy-section steel: gas and blowholes, sand spots and inclusions, internal shrinkage, hot tears, cracks, unfused chaplets, internal chills.

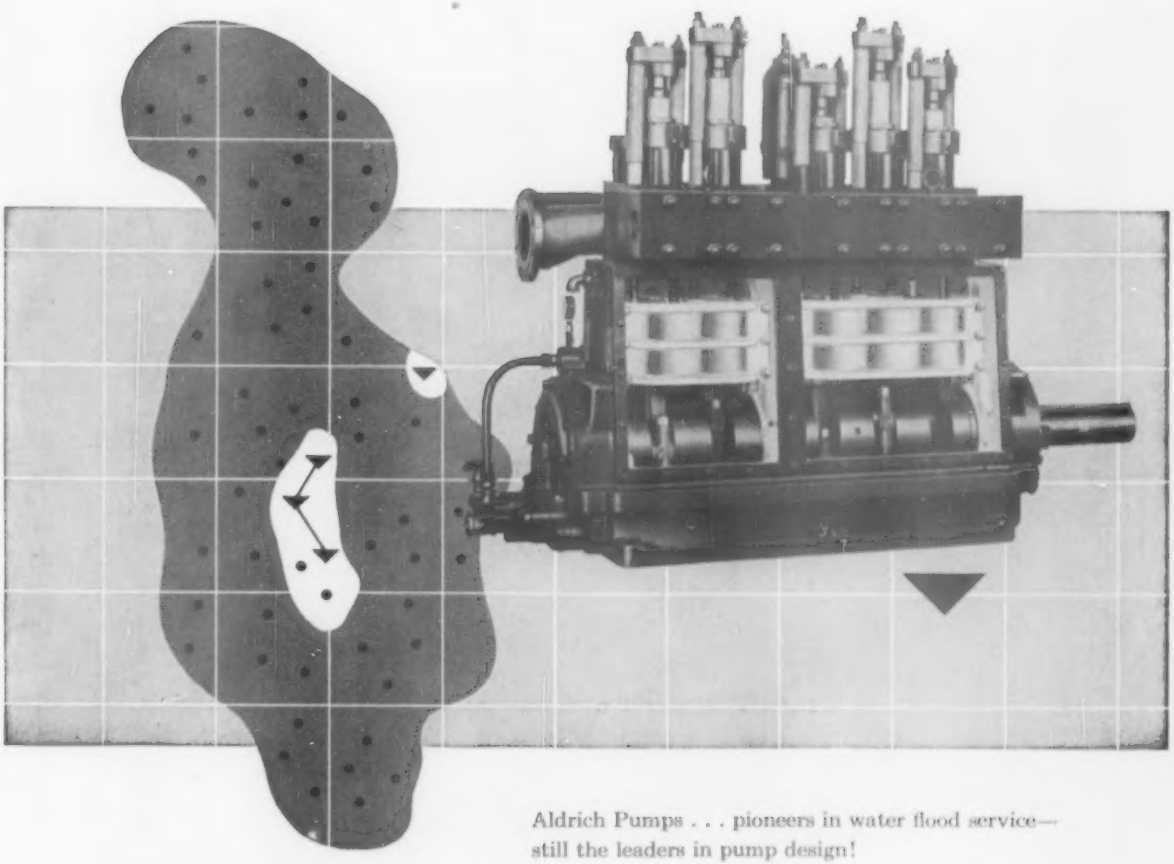
While the radiographic films mean little to the uninitiated, one familiar with them can spot defects to within 2% or less of the wall thickness. For example, if the total wall thickness should measure 2", it is possible to locate a blowhole or inclusion only .04" or less in diameter.

W-K-M uses gamma-ray inspection on the W-K-M 10,000—15,000 p.s.i. test valves. They are inspected according to the procedure outlined in the ASTM Spec. E 71-47T. When you specify valves for any high pressure service, be sure to remember that W-K-M high pressure valves are the soundest, safest buy in the field.

Top: W-K-M 2", 15,000 p.s.i. Steel Valve. Notice how lettering on the body and foundry mark (right) show up. The rectangle below the top hole is a penetrameter, a steel leaf (.05" thick) taped to the body to show the penetration of the gamma rays.
Bottom: The gamma ray "camera" contains 5000 millicuries of Cobalt 60, capable of penetrating 6" steel in 3.5 hours.

W-K-M Valves

W-K-M MANUFACTURING COMPANY, INC.
A SUBSIDIARY OF acf INDUSTRIES INCORPORATED
P. O. Box 2117, Houston 1, Texas Los Angeles, California
Export Office: 45 Rockefeller Plaza, New York, N. Y.



Get peak water flooding efficiency with ALDRICH field-proven Direct Flow pumps

Aldrich Pumps . . . pioneers in water flood service—still the leaders in pump design!

- *high speed*—greater volume from more compact pumps.
- *low maintenance costs*—KOSMOS Porcelain Plungers and completely sectionalized fluid-ends reduce maintenance, material costs and down time.
- *complete range of sizes*—3" Triplex, 5" and 6" Triplex and Multiplex units permit optimum combinations of pumps with maximum interchangeability of parts.
- *for corrosive service*—fluid-ends available in stainless steel or aluminum bronze.

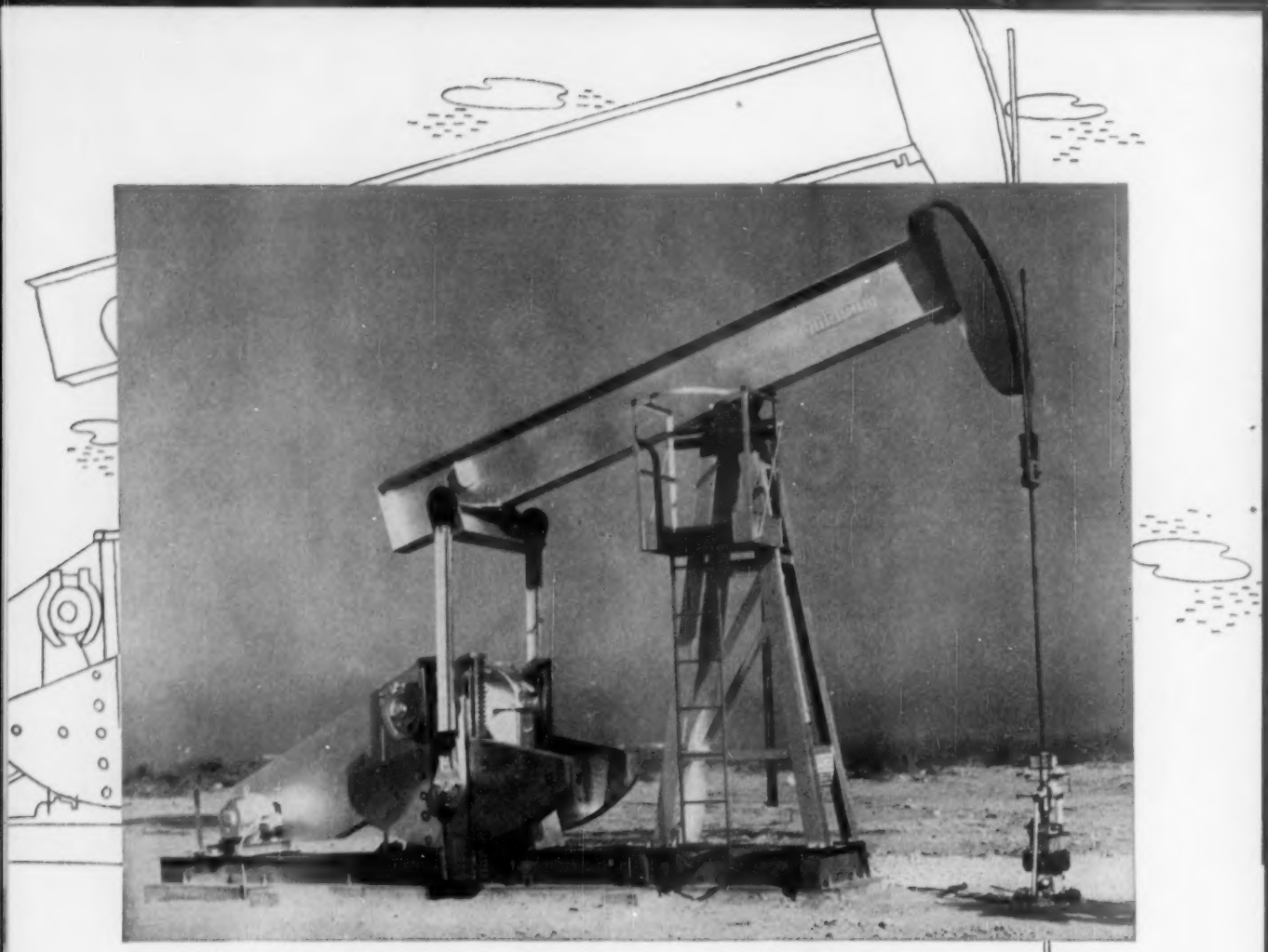
the ALDRICH *pump company*

. . . Originators of the Direct Flow Pump

9 GORDON STREET • ALLENTOWN, PENNSYLVANIA

Representatives: Bushnell Controls & Equipment Co., Inc., 5137 West Jefferson Blvd., Los Angeles 16, Calif. • Cross Pump & Equipment Co., P.O. Box 889, Charleston 23, W. Va. • Lloyd T. Gibbs Co., 1021 Petroleum Bldg., Tulsa 3, Okla. • Lloyd-Smith Co., Inc., Bradford, Pa. • Walter Norris Engineering Co., Civic Opera Bldg., 20 North Wacker Drive, Chicago 6, Ill. • Power Specialty Co., P.O. Box 6365, 2000 Kipling Street, Houston 6, Texas; The Suburban Bldg., Room 204, 5526 Dyer Street, Dallas 6, Texas • B. G. Harmon Service & Equipment Co., P.O. Box 309 (Farm Bureau Bldg.), Carmi, Ill. • Stearns-Roger Manufacturing Co., 1720 California Street, Denver 2, Colo. • Export: Petroleum Machinery Corporation, 30 Rockefeller Plaza, New York 20, N. Y.

Direct Flow Spare Parts Stock—at Carmi, Ill., Houston, Los Angeles, Odessa, and Tulsa



What an opportunity...
...for pumping Economy!

Parkersburg Pumpers combine Peak Performance with less maintenance, less servicing, less down time to bring lifting costs down to an irreducible minimum. Performance records in fields all over the world prove their unequalled efficiency and economy.

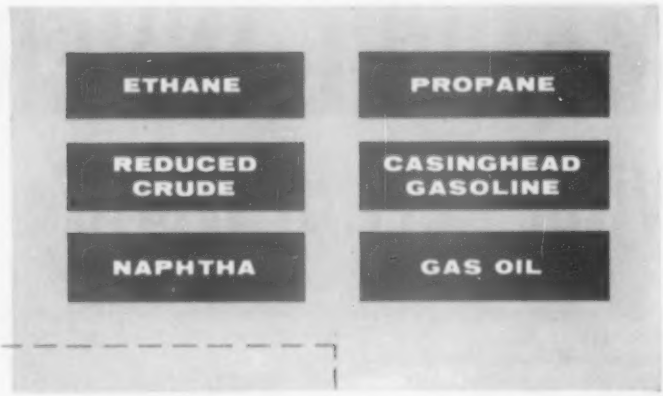
Designed and built to deliver this kind of service—and available in 56 sizes and types—you can take advantage of Parkersburg pumping economy, regardless of your well conditions. Ask your Parkersburg Representative to submit details and prices on Parkersburg Pumpers for your needs.

Parkersburg
RIG AND REEL COMPANY
DIVISION OF PARKERSBURG : AETNA CORPORATION

3345 WINTHROP AVENUE
FORT WORTH 16, TEXAS

5511

WHATEVER THE FEEDSTOCK FOR ETHYLENE



In ethylene manufacture, process engineering by The M. W. Kellogg Company offers many advantages over conventional systems, and guarantees optimum yields and purity from economically available feed stocks.

The key is M. W. Kellogg's steam-pyrolysis process. Used successfully in England for the cracking of heavy naphtha, it permits ethane and propane pyrolysis plants to be designed for higher yields; makes possible the economic production of ethylene and other olefins from casinghead or natural gasoline, residuals, and other low-value products; and indicates that even crude oil can be economically processed to a maximum of olefins instead of to gasoline.

M. W. Kellogg's steam-pyrolysis results have been marked by excellent yields of high purity olefins, generally higher than can be obtained by conventional cracking. This is due largely to the Kellogg process following cracking, where the stream is separated and purified in a low-temperature, low-pressure fractionation system.

Equally important, is the remarkable high on-stream efficiency which permits continuous plant operation at high conversions without the need for spare cracking furnaces.

The M. W. Kellogg Company has accumulated considerable cost data on ethylene manufacture, based on pilot plant and actual commercial production. Interested firms are invited to review these data with M. W. Kellogg chemical process engineers.

KEY TO BETTER YIELDS AND HIGHER PURITY

M KELLOGG W

PETROCHEMICAL PROCESSES AND PLANTS

CHEMICAL PROCESS DIVISION

THE M. W. KELLOGG COMPANY, 225 BROADWAY, NEW YORK 7, N. Y.

The Canadian Kellogg Company, Limited, Toronto • Kellogg International Corporation, London

SUBSIDIARIES OF PULLMAN INCORPORATED

MARVEL INVERSE OILER—

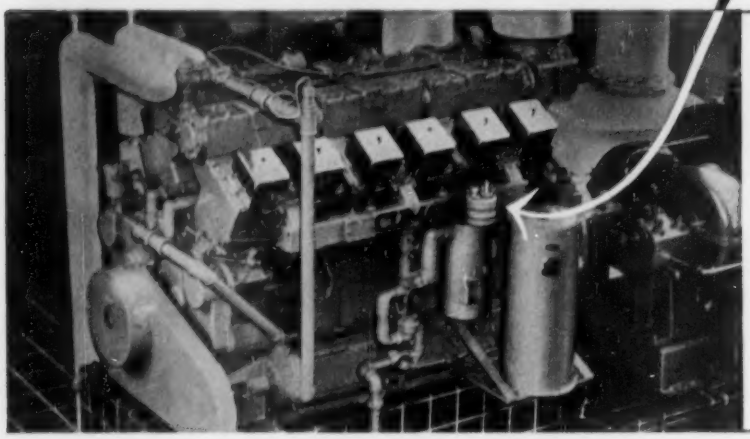
Vital Part of World's Finest Engines

Engine manufacturers think so highly of the Marvel Inverse Oiler they have incorporated it as a vital unit in their engines' lubrication systems.

They have found that engines, equipped with Marvel Inverse Oilers, can be depended upon to give quick acceleration to save trip time . . . keep operating costs to a minimum . . . guarantee hours of continuous performance . . . keep "down-time" low by extending periods between overhauls.

The famous Climax Engines, one of which is pictured below, is an example. A truly fine performer, it is equipped with a Marvel Inverse Oiler for Marvel Mystery Oil—finest performing lubricant of all.

The Marvel Inverse Oiler feeds Marvel Mystery Oil in exact proportion to engine speed and load . . . properly lubricating valves and guides, preventing wear and sticking. Keeps upper piston rings free in their grooves . . . retards ring flutter . . . and cushions ring pounding which can result in ring breakages. Remember, it is the *oil* which must do these things and only Marvel Mystery Oil is blended for this purpose and for this oiler.



The Marvel Inverse Oiler

is an integral part of the Climax 12 cylinder, 171 H.P., 600 RPM GAS ENGINE. Operating off the intake manifold, this completely automatic Oiler feeds Marvel Mystery Oil exactly in proportion to engine loads . . . gives direct protection to the all-important upper cylinder areas.

This Chart shows the proper setting for constant load engines

BRAKE H. P. AT BELT	NAT. GAS CU. FT. PER HOUR	BUTANE GALLONS PER HOUR	GASOLINE GALLONS PER HOUR	M. M. OIL DROPS PER MIN.	M. M. OIL HOURS PER QUART
10	115.	1.07	1.12	4	228
15	172.5	1.60	1.68	6	152
20	230.	2.14	2.24	8	114
25	287.5	2.67	2.80	10	91
30	345.	3.21	3.36	12	76
35	402.5	3.74	3.92	14	65
40	460.	4.28	4.48	16	57
45	517.5	4.81	5.04	18	50
50	575.	5.35	5.60	20	45
60	690.	6.43	6.72	24	38
70	805.	7.49	7.84	28	32
80	920.	8.56	8.96	32	28
90	1035.	9.63	10.08	36	25
100	1150.	10.70	11.20	40	22
120	1380.	12.84	13.44	48	19
140	1610.	14.98	15.68	56	17
160	1840.	17.12	17.92	64	14
180	2070.	19.26	20.16	72	12
200	2300.	21.40	22.40	80	11
225	2587.5	24.00	25.20	90	10
250	2875.	26.75	28.00	100	9
275	3162.5	29.42	31.10	110	8
300	3450.	32.10	33.60	120	7

Chart shows total oil consumption

EXAMPLE:—If you use 805 cu. ft. of dry gas, 7.49 gallons of butane or 7.84 gallons of gasoline, your H.P. is about 70, so adjust oiler to feed 28 drops per minute. You will then receive about 32 hours per quart of MARVEL MYSTERY OIL.

If engine load increases after setting for normal load, oiler will automatically increase its feed, decreasing when load is lessened.

To determine drop count per oiler when more than one is used on an engine—divide recommended drop count by number of oilers.

NOTE: Guarantee on oiler is void if any other oil than MARVEL MYSTERY OIL is used. Some *engines* also carry this guarantee policy.

See Your Local Jobber or Oil Well Supply House

EMEROL MFG. CO.

Dept. 369, 242 West 69th Street New York 23, N. Y.

Kennametal* Balls and Seats outlast best alloys 26 to 1 ...still in service in problem well pump

Strongly corrosive cuts from this Ventura Avenue field destroyed the effectiveness of the best alloy steel balls and seats in a maximum of three weeks' service.

A year and a half ago, the operator installed Kennametal top and bottom valving to meet these conditions. During this period, he has surfaced the pump every four months because of plunger wear, but has not found it necessary to replace the Kennametal Balls and Seats. Already they have outlasted the best alloy steels 26 to 1, and they're still in service.

Performance reports such as these are not unusual. Kennametal Balls and Seats are reducing the costs of string pulls, maintenance and loss of production wherever they are used. If you have a problem well, ask your pump service man to install Kennametal valving. It will cost you less in the long run.

Kennametal lightweight (titanium-carbide) balls have proven themselves in wide usage throughout the oil industry. They are one-third lighter than steel and about one-half lighter than tungsten-carbide. Outstanding results have been obtained in applications where there is excessive leaching in fluids containing hydrogen sulfide cuts, in pumps that pound for fluid and in slant pumping where there is excessive cage wear. Their resistance to wear, corrosion and electrolytic action represents an advance over any other type of ball as a utility unit. KENNAMETAL INC., Latrobe, Pa.

**Kennametal is the registered trademark of a series of hard carbide alloys of tungsten, tungsten-titanium and tantalum.*

INDUSTRY AND
KENNAMETAL
...Partners in Progress

5501

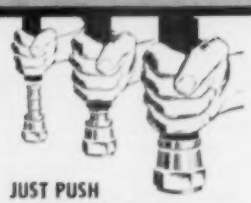
Make All Your Low Pressure Hose Lines from This *NEW* Aeroquip Kit

SPEED REPLACEMENT! CUT COSTS! REDUCE INVENTORY!

DURABLE ALL-STEEL BOX

Back of fitting tray can be raised for convenient use

Compartment of Kit 5144 contains 24 ft. of ¼" hose, and 24 ft. of ⅜" hose



JUST PUSH Aeroquip 1525 Hose on the SOCKETLESS Fitting . . . It Stays On Even at Pressures as High as 250 p.s.i.

PATENT APPLIED FOR

Kit 5144 contains 93 fittings and adapters in 20 sizes and types

Pull out hose, measure it, and cut with knife

Many users have requested a permanent-type container for Aeroquip *SOCKETLESS* fittings and hose. So this durable all-steel Kit 5144 is now available. It contains an inventory of hose, fittings, and adapters in types and sizes that will meet practically all low pressure applications.

With remarkable new Aeroquip *SOCKETLESS* fittings and hose, fuel, oil, water, and air lines can be made and installed *extra fast* on all kinds of industrial and mobile equipment. Field replacement is simplified because Kit 5144 is compact (12½" x 12½" x 6½" when closed) and it will stand up in field service.

Aeroquip *SOCKETLESS* fittings and hose are saving time and money for users in every industry. Get the complete story from your Aeroquip distributor, listed in your Yellow Page Directory, or write us.

Also Available: 15-Cell Kit No. 5143 with 24 feet of ¼" hose and 71 fittings and adapters in same box.

Aeroquip

REG. TRADEMARK

AEROQUIP CORPORATION, JACKSON, MICHIGAN

LOCAL REPRESENTATIVES IN PRINCIPAL CITIES IN U.S.A. AND ABROAD • AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD

Sargent PUMPS

engineered to lift more oil per day at lower costs per barrel

Recognized leader in the development of bottom-hole production pump design, Sargent leads the field in pump engineering, combined with research and manufacturing skill to build pumps that put more oil in your tanks every day, month after month, with minimum maintenance and at lower cost per barrel.

SERVICE Sargent recognizes the importance of pump maintenance and provides the most complete service facilities in the industry. This service is always available through Sargent sales and service stores conveniently located throughout the oil country and staffed by company-trained pump experts.

On the basis of performance and service, Sargent pumps give you more for your money.

Write for complete details.

Sargent, who originated the Insert Rod Sectional Liner Pump, once again offers the latest and best method of pumping oil, through its development of the Sargent Rodless Hydraulic Pump. This pump puts the long stroke unit at the bottom of the well, where it belongs, to operate hydraulically the time-proven standard bottom-hole pump. Rod problems and tubing wear are eliminated. The ultimate in gas compression ratio (elimination of gas lock) is thus obtained with this unit because pump valves are accurately spaced before the pump is run into the well.

Standard Sargent API pump parts facilitate service maintenance of the rodless pump, which can be repaired in any of the Sargent sales and service stores.

SALES & SERVICE

CALIFORNIA
Long Beach
Bakersfield
Santa Maria
Ventura • Taft
Huntington Park

OKLAHOMA
Oklahoma City
Pawhuska
Tulsa • Seminole

TEXAS
Odessa
Snyder
Houston
Sundown
Wichita Falls
Quitman

NEW MEXICO
Hobbs

KANSAS
Chase
Russell

ILLINOIS
Grayville

ARKANSAS
Magnolia

COLORADO
Rangely

Standard of Excellence — *Since 1920*

Sargent

ENGINEERING CORPORATION

2533 East 56th Street
Huntington Park, California

BUILDS PUMPS THAT BUILD GOOD WILL

"GOOD WILL" is the disposition of the pleased customer to return to the place where he has been well treated.
U. S. Supreme Court

G.E. DEVELOPS NEW PLUG-IN CHASSIS FOR 2-WAY RADIO

NEW PROGRESS LINE saves money on maintenance through faster servicing—protects from obsolescence because chassis are quickly interchangeable.

IN the new Progress Line, transmitter, receiver, power supply and optional chassis are individually rack-mounted in a triple-rigid mobile case. Rapid interchangeability is provided by this rack construction and true plug-in chassis. This plug-in design permits changes in frequency, power, type of reception (narrow or wide band) quickly *at minimum cost, at any time.* You're free of any obsolescence risk!

You may switch Progress Line mobile units—whether front or trunk mount, between vehicles with 6 or 12 volt DC systems. No electrical alterations are needed. And any mobile combination can be converted quickly to a low-cost, 117 volt AC intermittent duty base station by changing only the power supply chassis!

Let a G-E Communications Counselor analyze your radio needs and develop an installation or conversion program planned for long-run savings. Write or call today for full specifications on the new PROGRESS LINE. *General Electric Company, Communication Equipment, Section X855-2, Electronics Park, Syracuse, N. Y.*

INDIVIDUAL PLUG-IN CHASSIS minimize capital investment in spares and reduce radio maintenance time! Your vehicles will be back "in service" faster. For instance, you can replace either a transmitter or receiver plug-in chassis right in the vehicle in 5 minutes—using only a screwdriver. Individual plug-in chassis of the new General Electric Progress Line units also provide complete interchangeability between mobile and station transmitters and receivers.

◀ There is a G-E Authorized Service Station near you. Look for this sign.

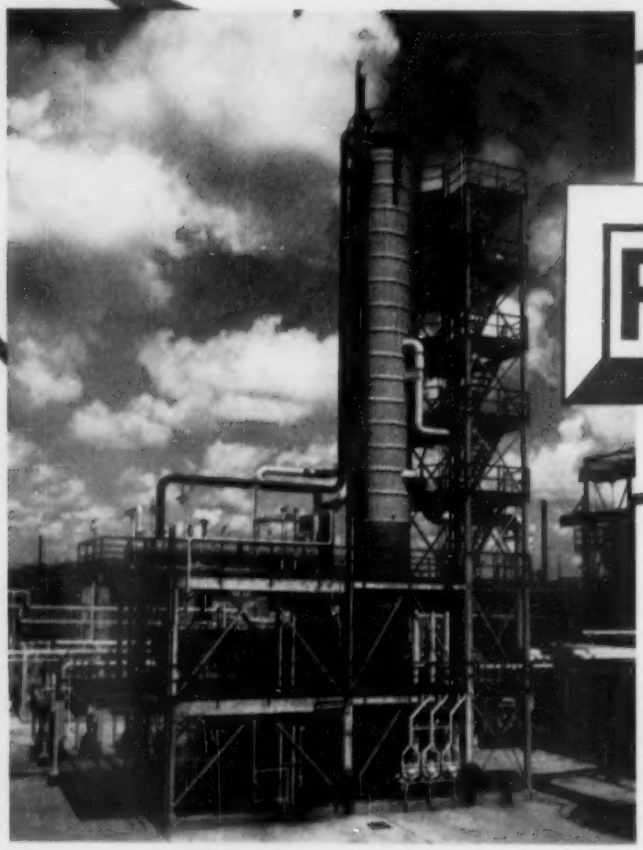
EASY FRONT MOUNTING under the dash. The new G-E Progress Line case is less than 15" deep. For the first time you can have a 90-watt front mount mobile unit in the 25-54 MC band and a 50-watt front mount mobile unit in the 144-174 MC band. In the 25-54 MC band you can now have simultaneous monitoring of 2 channels, in the same case, without additional equipment.

Progress Is Our Most Important Product

GENERAL ELECTRIC

KERMAC
The Right Men and Equipment for any Drilling Job...
ON LAND AND AT SEA
KERR-McGEE
OIL INDUSTRIES, INC.
General Offices • Oklahoma City
KERMAC

GETTING THE BEST OF OIL !



PARSONS

When Esso Standard Oil Company wanted a distillation unit for lubricants production they selected The Ralph M. Parsons Company from competitive bidders to do the job. This plant has been in operation at Baton Rouge, Louisiana, for nearly a year.

By having Parsons handle mechanical design, procurement and construction, Esso gained all the advantages of working with a single organization with a single responsibility.

THE RALPH M. PARSONS COMPANY

ENGINEERS • CONSTRUCTORS

617 South Olive Street, Los Angeles 14, California

NEW YORK • TULSA • WASHINGTON

ANKARA • BAGHDAD • BEIRUT • KARACHI • NEW DELHI • PARIS

WHY IT PAYS YOU TO BUY HERE...

Have you ever wondered why it is more economical, in the long run, to buy oil field supplies from one supply store rather than another? You'll get all sorts of reasons from our customers on this question, but all comments boil down to three major points.

National Supply customers expect and get quality products at the right price . . . whether they are major equipment items, maintenance or operating supplies . . . items that are the most reputable in their fields. And, the sales policies of both the manufacturer and National Supply assure the customer product satisfaction on each item purchased.

Secondly, our customers expect and get the types of quality products that they need in their operations. That's why you'll never find a standard stock list that applies to all of our one hundred and twenty-four stores. In areas where production is predominant, National Supply store stocks reflect that importance. As a result of supplies tailored to the activity in an area, a store may carry 2,000 or 12,000 items to give you delivery on the kind of item you need.

Probably the most important factor of all to our customers is the brand of service they get when they deal with the local National Supply store. Extra prompt handling of orders, complete concern for equipment performance and extraordinary assistance on emergency problems are some of the outstanding reasons why more and more oil men become and remain National Supply customers.

You can readily check the dollar and cents value of this service for yourself by visiting the nearby National Supply store soon.

THE
NATIONAL SUPPLY
COMPANY

Here's new, improved pumping performance for your wells!

NATIONAL "E Series" Pumping Units

Advanced design, stemming from National's continuing research and field testing, has been applied to pumping units to give you even longer equipment life and lower pumping costs. Here are some of the specific improvements you'll find in the National "E Series" line:

Easy-to-install, extra strong main base. Box and sub-base design of the "E Series" provides maximum strength, rigidity and counterweight clearance for quick and simple floor level installation.

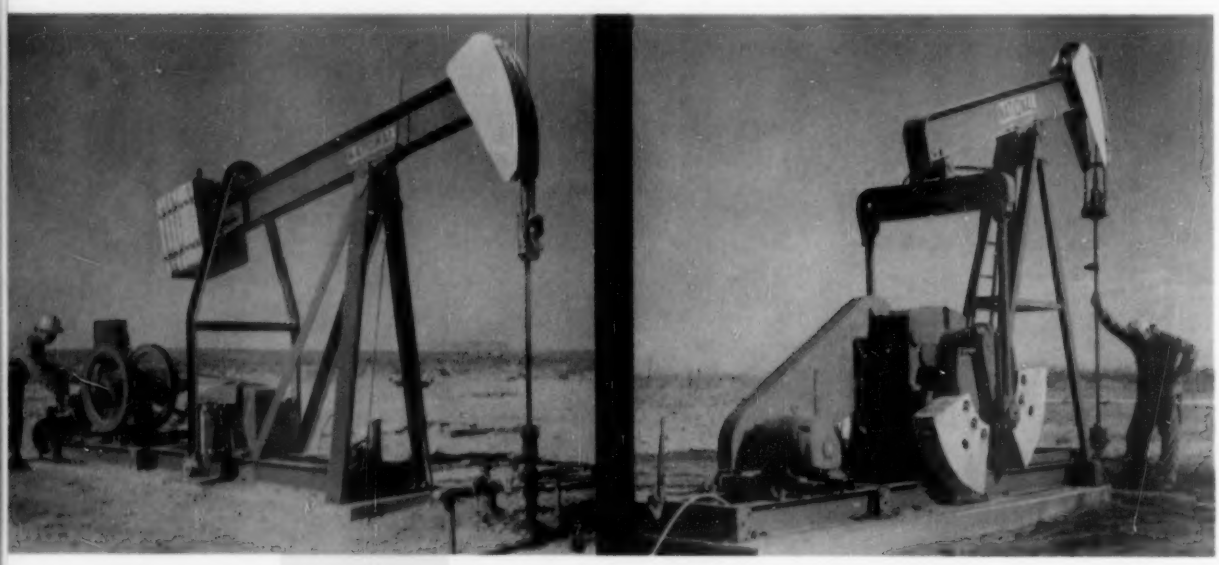
Rugged gear reducer for extra stamina and longer life. National "E Series" Pumping Units feature exceptionally hard alloy steel gears and pinions designed for long wearing life. Gear train mounting and main bearings offer lower shaft loading and deflection . . . easily handles shock loads from load reversals.

Exceptionally stable, well-balanced samson post. Legs are rigidly cross-braced, designed to distribute beam load over entire foundation area, and to give better balance for transporting.

Pitman assembly features easy maintenance, fast assembly. Simple, clean design of component parts of the "E Series" Pitman assembly assures positive alignment and proper fitting. Over-all construction of the assembly makes field servicing simple and easy.

Rugged walking beam and beam hanger for extra years of service. Heavy duty walking beam is designed for minimum critical stress in National's "E Series" Pumping Units. The beam hanger design assures correct alignment to the polished rod throughout the stroke range and is built for easy field servicing of its component parts.

Get the complete facts on National "E Series" Pumping Units today. For the full story on the new high standards of quality and performance offered by National's "E Series" Pumping Units, see the National Supply Store men or representatives in your area soon. New bulletins describing these pumping units are available.



THE
NATIONAL SUPPLY
COMPANY

MAIN OFFICE: Two Gateway Center, Pittsburgh 22, Pennsylvania • DIVISION OFFICES: Denver; Ft. Worth; Houston; Toledo; Tulsa; Torrance • CANADA: The National Supply Company, Ltd., 200 F.W. Clark Building, 709 Eighth Avenue, West, Calgary, Alberta • EXPORT: 600 Fifth Avenue, New York 20, N.Y., U.S.A.; River Plate House, 12 South Place, London E.C.2

NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT • SPANG STEEL PIPE ELECTRICAL CONDUIT

There are over **22 NATIONAL Pumping Unit** *combinations to meet your well requirements*

Beam Counterweighted Types	API Walking Beam Rating, Lbs.
D-3	3,200
D-4	4,100
D-5	4,790
D-7	6,500
E-9	8,900
E-11	11,000

Crank Counterweighted Types	
E-9	8,900
E-11	11,000
E-13	12,750
E-15	15,000
E-21	21,000
E-24	24,000
D-29	29,800
D-32	32,400

National's complete line of Pumping Units offers a model to economically suit every pumping job. In the range of API rated beam loads from 3,200 to 32,400 lbs., there are 22 standard combinations to meet your requirements. Complete details are available at the local National Supply Store in your area.

See the next page for other profitable

NATIONAL PRODUCTION EQUIPMENT

for improved performance in any recovery method...

specify **NATIONAL**

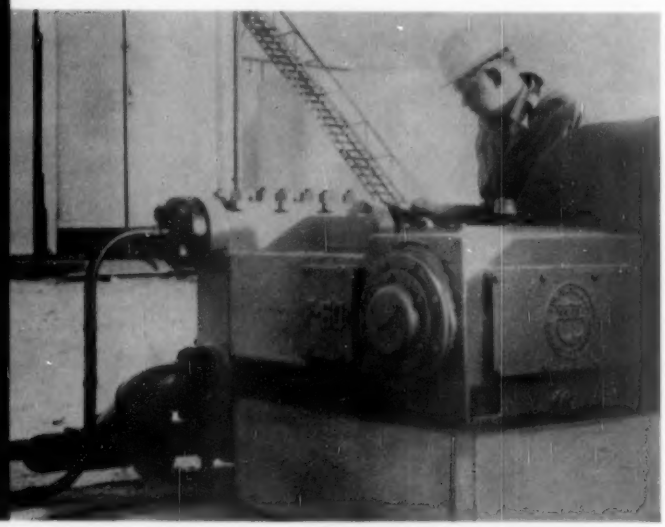
PRODUCTION EQUIPMENT

NATIONAL
Wellhead Equipment
has interchangeable units which provide a multitude of combinations to meet your specific needs in size, capacity and type. Ease of assembly and pre-tested safety are two major features of this equipment.

NATIONAL *Sucker Rods*
are precision-manufactured in a range of grades engineered to suit virtually all well conditions, and readily available at the National Supply Store nearest you.

NATIONAL *Triplex Pumps*
provide maximum volume and injection pressures for today's waterflood projects. Available in several h.p. ratings, they are also usable for salt water disposal, oil gathering, or as power-oil sources for sub-surface hydraulic pumping.

NATIONAL
Ideal Plunger Lift®
uses formation pressure for economically producing wells where reservoir conditions are suitable. For these certain types of wells, the Ideal Plunger Lift can be the best production method to use.



THE
NATIONAL SUPPLY
COMPANY

MAIN OFFICE: Two Gateway Center, Pittsburgh 22, Pennsylvania • DIVISION OFFICES: Denver; Ft. Worth; Houston; Toledo; Tulsa; Torrance • CANADA: The National Supply Company, Ltd., 200 F.W. Clark Building, 709 Eighth Avenue, West, Calgary, Alberta • EXPORT: 600 Fifth Avenue, New York 20, N.Y., U.S.A.; River Plate House, 12 South Place, London E.C.2

NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT • SPANG STEEL PIPE ELECTRICAL CONDUIT

ALL FORGED STEEL

EDWARD VALVES FOR THE OIL INDUSTRY

Fig. 158 Globe

TOP PRESSURE GLOBE AND CHECK VALVES

Ratings — 2" size 7500 lb WOG Smaller sizes 6000 lb WOG

All forged globe stop valves for positive shut-off or accurate pressure control, also dependable ball check valves for protection against sudden reversal of flow, in pressure systems up to 7500 psi. Globe valves have EValloy 13% chromium stainless steel seat, disk and stem. Check valves have EValloy seat, high carbon stainless steel, wear resisting ball. Suitable for liquid or gas services. Alloy steel body used on 2 in. size. Check valves may be installed in horizontal or vertical lines.

Size range: ¼", ⅜", ½", ¾", 1", 1¼", 1½" and 2".

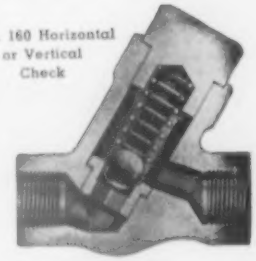


Fig. 160 Horizontal or Vertical Check

Fig. 444 Globe

GLOBE AND ANGLE VALVES

Ratings — 2000 lb WOG 850 lb at 750 F

All forged–all purpose valves ideal for almost all services where small forged steel valves may be used. Streamlined body and rugged bonnet both forged steel. Fig. 444 with union bonnet in sizes 1 in. and smaller. Fig. 448 with bolted bonnet in sizes 1¼, 1½ and 2 in. Bronze bushed yoke, simplified bolted gland design for easy packing adjustment. EValpak high pressure-high temperature die-molded packing. Stem, disk and seat of EValloy 13% chromium stainless steel. Available with screwed or socket welding ends. Angle valves designated Fig. 445 and Fig. 449.

Size range: ¼", ⅜", ½", ¾", 1", 1¼", 1½" and 2".

Fig. 448 Globe

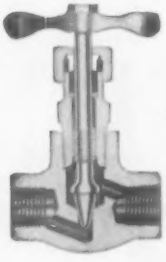


Fig. 152 Globe

GAGE VALVES

Ratings — 4000 lb WOG 600 lb at 750 F

Drop forged, instead of barstock, steel valves for gage, meter, dead-end, instrument and other small lines. Taper threaded bonnet joint. Long taper semi-needle type stem-disk for close regulation and tight seating. Fig. 152 has carbon steel body with EValloy 13% chrome stem-disk. Also available in all 13% chrome stainless steel and in all 18-8 stainless steel. Sizes ¾ and 1 in. have union bonnet. 152J has male inlet, female outlet. Angle valves designated Fig 153 and Fig. 153J.

Size range: ⅛", ¼", ⅜", ½", ¾" and 1".
(Fig. 152J available ½" size only.)

Fig. 152J

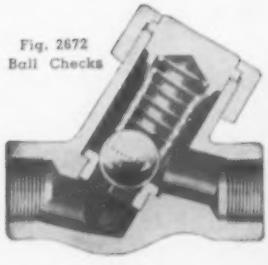


Fig. 2672 Ball Checks

BALL AND PISTON CHECK VALVES

Ratings — 1440 lb WOG 850 lb at 750 F

General service small check valves that give freedom from shock or excessive vibration, yet seat quickly and tightly upon flow reversal. Size 1¼ in. and larger with bolted cover. Sizes 1 in. and smaller with union cover. Corrosion resistant trim in all designs.

Size range: ¼" to 2" inclusive.

Fig. 4638 Bolted Cover Checks

ROCKWELL-BUILT EDWARD VALVES

For Mudline Service Use the EDWARD MUDWONDER — The All-New Alloy Steel Valve

Edward Valves, Inc.

Subsidiary of ROCKWELL MANUFACTURING COMPANY

1212 West 145th Street

EAST CHICAGO, INDIANA

EDWARD BUILDS . . . a complete line of forged and cast steel valves from ¼" to 16" in GLOBE and ANGLE STOP, GATE, NON-RETURN, CHECK, BLOW-OFF, STOP-CHECK, RELIEF, HYDRAULIC, INSTRUMENT, GAGE and SPECIAL DESIGNS for pressures up to 7500 psi with pressure-seal, bolted, union or welded bonnets and screwed, welding, or flanged ends . . .

FOR THE OIL INDUSTRY Write For Catalog 105

The most compact, reliable sampler ever built . . .

THE NEW Gilbarco

Small in size . . .
light in weight

AUTOMATIC SAMPLER

Here's a new compact, completely automatic, magnetically powered and electronically controlled sampler designed to provide a continuous sample from process or pipe lines.

USERS GET ALL THESE IMPORTANT ADVANTAGES.

- ★ Proportional to time or flow
- ★ Settings for 20 to 300 cycles per minute for more accurate sampling
- ★ No packing glands, no leakage
- ★ No electric motor, no mechanical switches
- ★ Simple to install and service
- ★ LOW initial cost . . . LOW maintenance cost
- ★ Completely explosion-proof . . . no pressure relief valves required
- ★ No hold-up time from pipe line to sample receiver; because a portion of the stream is by-passed through the sampler

Before you buy any other sampling unit, write for full details on this New Automatic Sampler.

GILBERT & BARKER MFG. CO. • WEST SPRINGFIELD, MASS. • TORONTO, CANADA

None other like it!

Thermoid

TRIOFLEX Rotary Hose

Designed for portable drilling units, workover rigs and seismograph work, Thermoid Trioflex Rotary Hose gets the job done faster. It's light, flexible, easy to handle, and kink-resistant. And its brute strength means longer wear . . . fewer replacements.

Study its cross section view:

- Synthetic rubber tube resists oil and abrasion
- Braided steel wire reinforcement adds strength and flexibility
- Tough, specially compounded cover resists abrasion and aging

Every length pre-tested to 2000 psi

Furnished in three sizes:

2″—with 2″ male couplings, API threads

2½″—with 2½″ male couplings, API threads

3″—with 3″ male couplings, API threads

Get Trioflex and other Thermoid oil field products listed below from your supply house or from one of the Thermoid warehouses located in:

Houston, Texas
Oklahoma City, Okla.
Nephi, Utah
Casper, Wyoming
Los Angeles, Cal.

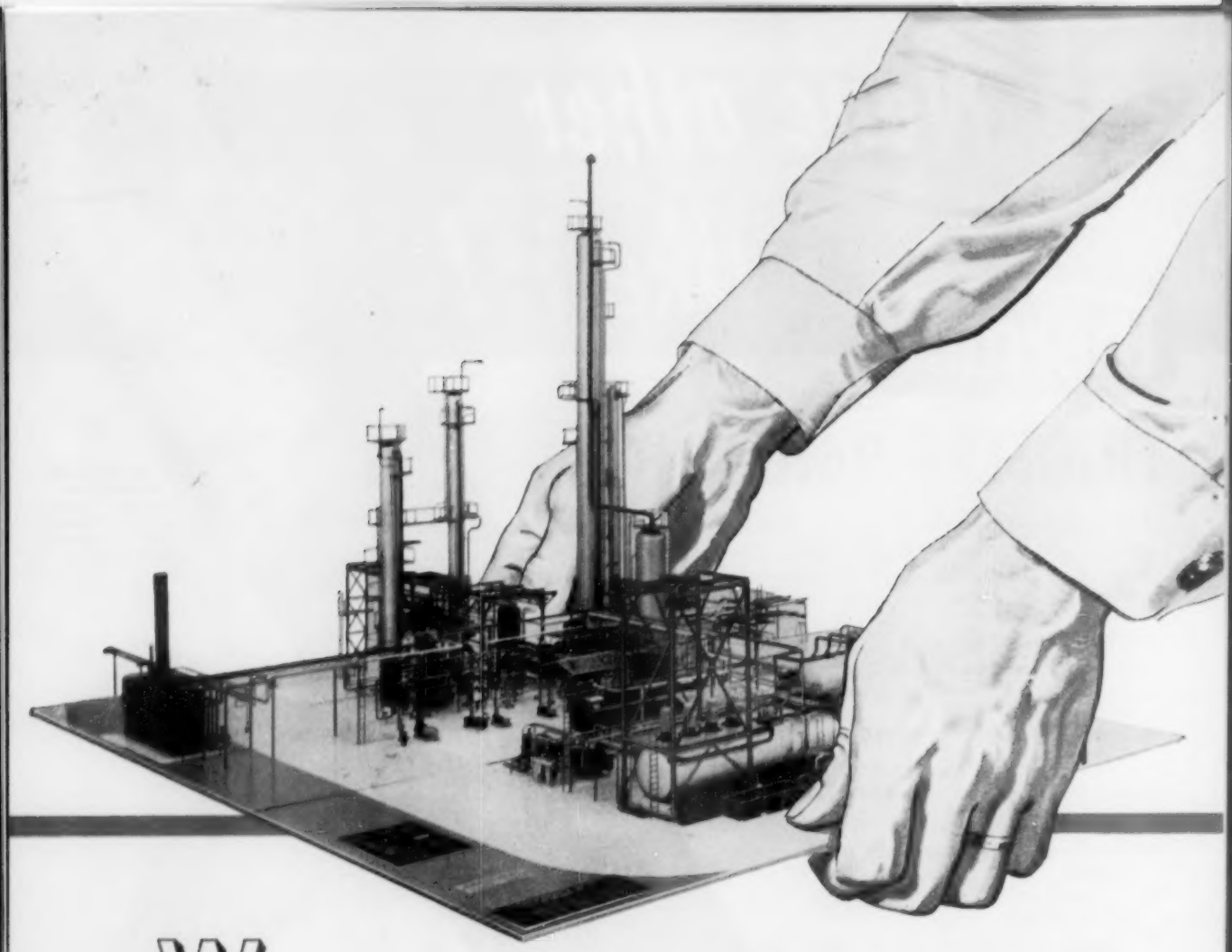
* Special pressed-on couplings are an exclusive Thermoid design. Anchored securely . . . guaranteed for life of hose.

Thermoid

Powerflex Rotary Hose • Trioflex Slim-Hole Rotary Hose • Mud-Flo Slush Pump Hose • Flexible Discharge Units • F.H.P. and Multiple V-Belts • Oil Country Flat Belting

Wire Line Turn Backs • No-Wip Line Savers • Stuffing Box Rings • All Types of Hose • Molded Specialties • Brake Blocks

Thermoid Company • Offices & Factories: Trenton, N. J., Nephi, Utah



Where do you want your new plant shipped?

EVER stop to think that your new plant will have to be shipped—literally in pieces—to the site?

That will take a lot of planning, buying, expediting and inspection of materials and equipment. These functions are all part of the complete design, engineering and construction services McKee renders, but the important factor is McKee experience—a half-century of world-wide experience that's available for all phases of your project from preliminary site study to completed plant ready for initial operation.

50th ANNIVERSARY

McKee Engineering Services

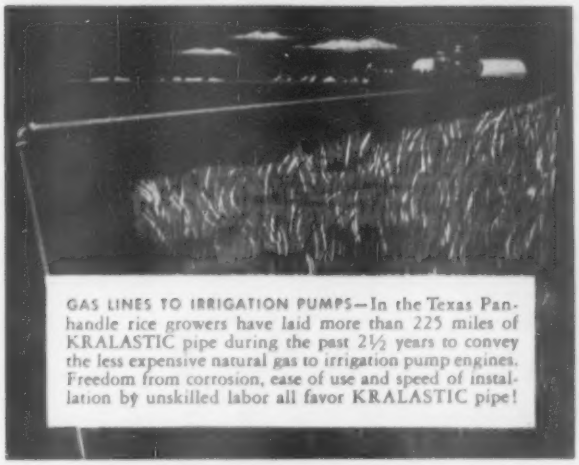
Arthur G. McKee & Company • Engineers and Contractors

Headquarters: McKee Building • 2300 Chester Avenue • Cleveland 1, Ohio
Offices: New York • Tulsa, Oklahoma • Union, N. J. • Washington, D. C.
British Representatives of Metals Division: Head, Wrightson & Co., Limited
Canada: Arthur G. McKee & Company of Canada, Ltd., 372 Bay St., Toronto

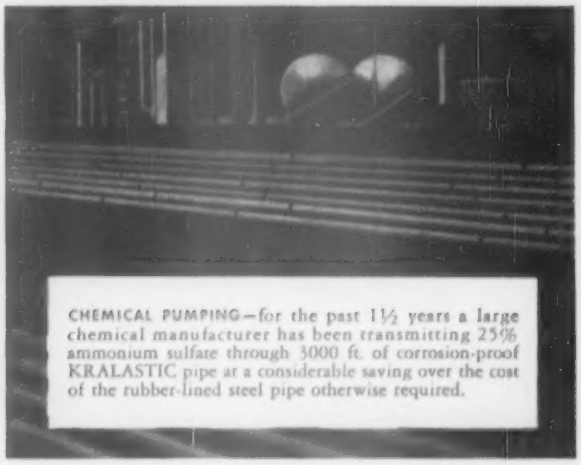
KRALASTIC Corrosion-Proof Pipe Makes Good in Many Fields!

SALT WATER DISPOSAL—Operating under 20" to 28" of vacuum at 110°F. in a Texas oil field, a 4100 ft. stretch of 4" KRALASTIC pipe is still going strong after two years. A previous installation of pipe lasted only 6 weeks.

OIL FLOW LINES—Carrying very corrosive sour crude, a 1200 ft. section of 3" KRALASTIC pipe has performed satisfactorily for more than 2½ years for a Texas oil company. Metal pipe previously used failed in only 4 months.



GAS LINES TO IRRIGATION PUMPS—In the Texas Panhandle rice growers have laid more than 225 miles of KRALASTIC pipe during the past 2½ years to convey the less expensive natural gas to irrigation pump engines. Freedom from corrosion, ease of use and speed of installation by unskilled labor all favor KRALASTIC pipe!



CHEMICAL PUMPING—for the past 1½ years a large chemical manufacturer has been transmitting 25% ammonium sulfate through 3000 ft. of corrosion-proof KRALASTIC pipe at a considerable saving over the cost of the rubber-lined steel pipe otherwise required.

KRALASTIC pipe is made from a unique combination of plastic and elastomeric materials. It is different both in composition and characteristics from materials used in other types of plastic pipe.

KRALASTIC produces pipe and pipe fittings that are both hard and tough, low in weight, high in tensile strength and unaffected by most chemicals that corrode metals.

KRALASTIC pipe is easily sawed and solvent-welded, or threaded for connection to metal fittings. Be sure the plastic pipe you buy is KRALASTIC. Write us for the names of firms making KRALASTIC® pipe.

Naugatuck Chemical

Division of United States Rubber Company
Naugatuck, Connecticut

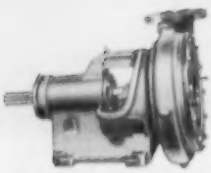
BRANCHES: Akron • Boston • Charlotte • Chicago • Los Angeles • Memphis • New York • Philadelphia • IN CANADA: Naugatuck Chemicals, Elmira, Ontario
Rubber Chemicals • Synthetic Rubber • Plastics • Agricultural Chemicals • Reclaimed Rubber • Latices • Cable Address: Rubexport, N.Y.

Introducing the ***new***

BJ OIL FIELD PUMPS

rugged, heavy-duty pumps... backed by 80 years of pump experience

Engineered for oil field service—that's the key to the years of dependable duty built into Byron Jackson's new centrifugal oil field pumps. With higher strength construction...an exclusive impeller design...and heavy duty capacities, BJ Oil Field Pumps do more, save more on rugged rig jobs.



MUD PROCESSING AND SUPERCHARGING PUMPS

...boost efficiency of low-power mud pumps and eliminate use of expensive reciprocating pumps. Increase slush pump circulating capacity and maintain higher bottom hole pressures. Medium Duty Model—1000 GPM capacity at 37 psi. Heavy Duty Model —1200 GPM at 50 psi.

WASHDOWN AND BRAKE COOLING PUMPS

...handle heavy operations with belt or direct coupling drives at speeds up to 2800 RPM. Stainless steel shaft, with extra heavy construction for pulley drive, is accurately machined for ball bearings. Available with clockwise or counter-clockwise rotation.

**Motor-mounted models available in 1½" and 2" sizes.*

PNEUMATIC SPONGE PUMPS

...for dewatering rig cellars, dikes, ditches and general sump use. Just connect to air source and this pump is ready to work. Needs no priming. Portable. Handles sand and abrasives. Heads to 76 ft. and capacities to 380 GPM.

Write for this helpful guide to selecting proper oil field pumps. Includes operating data, specifications and prices. Bulletin BJO-719.

BJ

SINCE 1872

Byron Jackson Co.

OIL TOOL DIVISION

P.O. BOX 2017, TERMINAL ANNEX
LOS ANGELES 54, CALIFORNIA

Offices in Houston, Fort Worth, Denver and New York. Sales engineers in all principal oil fields.

MURPHY DIESELS

are rugged, dependable, economical

Says:

John S. Hagestad
Hagestad Drilling Company
Bakersfield, California

Another in the growing list of satisfied Murphy Diesel owners is John S. Hagestad, drilling contractor of Bakersfield, Cal. He reports his experience as follows:

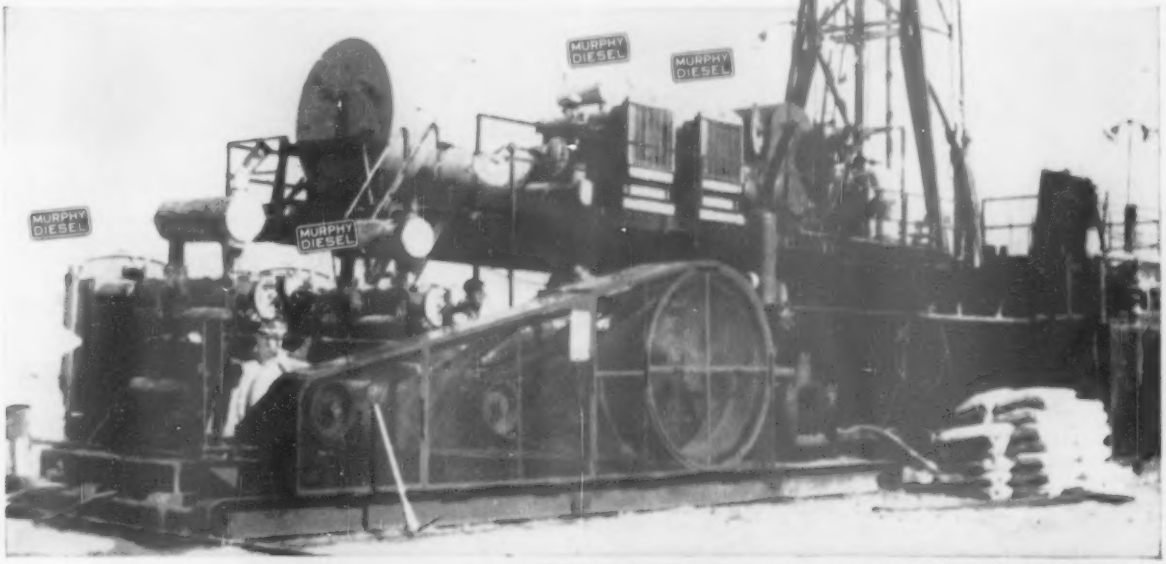
"The two Model 20 G Dual Fuel Murphy Diesels on our new Emsco G. B. 350 drawworks have performed satisfactorily in every respect. Our entire crew is pleased with their ruggedness and dependability which are most suitable for oilfield operation. We have already observed economy in fuel savings.

"We also have two Model 220 G Murphy Dual Fuel engines driving our D-300 Emsco Pump (7¼ - 14") at 70 strokes per minute. Under these conditions pressures and volume are ample for jet bit drilling."

Mr. Hagestad has demonstrated his sincerity with an order for four more Murphy Diesels. This is real proof of satisfaction. You, too, can get this same kind of satisfaction. The first step is to ask your Murphy Diesel Dealer to show you what Murphy Diesel Power can do for you.

MURPHY DIESEL CO. | 5305 W. Burnham St. Milwaukee 14, Wisconsin

Murphy Diesel Engines and Power Units are available in sizes from 96 to 296 H.P. Dual Fuel Engines from 185 to 267 H.P. Generator Sets, 64 to 165 H.P.



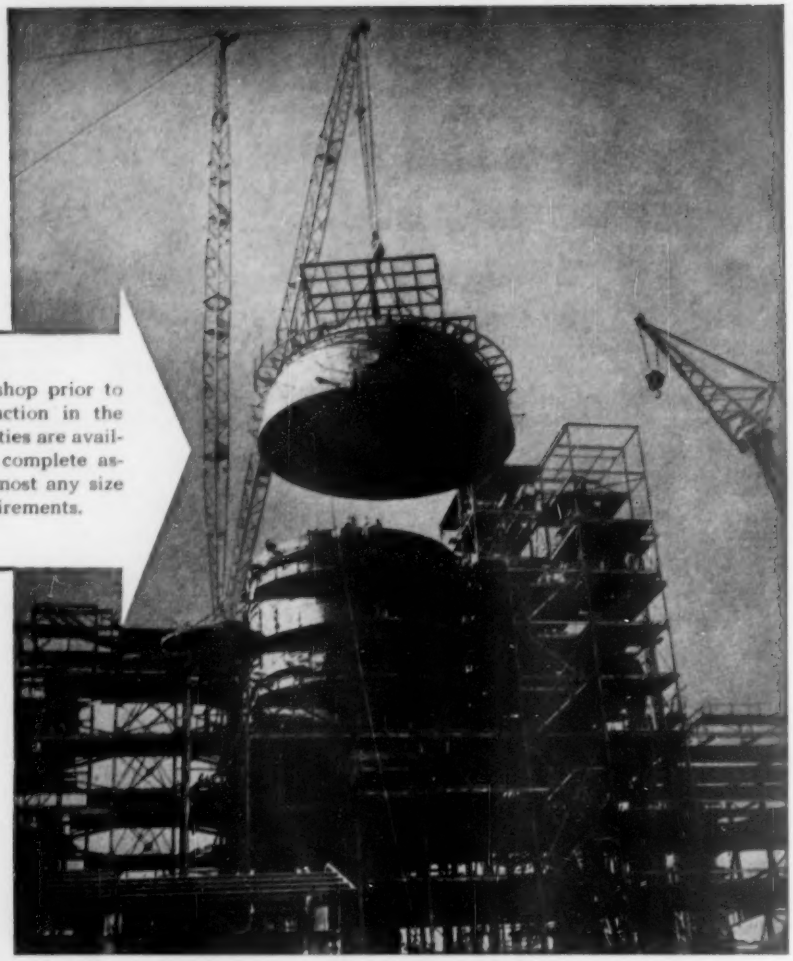
309

MURPHY DIESEL

SEE YOUR MURPHY DIESEL-DEALER, TODAY—

ALBUQUERQUE, NEW MEXICO, Lively Equipment Company; BUTTE, MONTANA, Hall-Perry Machinery Company; CORPUS CHRISTI, TEXAS, Houston Engine & Pump Company; DALLAS, TEXAS, Conley-Lott-Nichols Machinery Co.; DENVER, COLORADO, Macdonald Equipment Co., Inc.; EDMONTON, ALBERTA, CANADA, Northern Engine & Equipment Co., Ltd.; GREAT BEND, KANSAS, Manufacturers Dist. Co.; GREAT FALLS, MONTANA, Hall-Perry Machinery Company; HOUSTON, TEXAS, Houston Engine & Pump Co., Inc.; JACKSON, MICHIGAN, Utility & Industrial Supply Co.; LOS ANGELES, CALIFORNIA, Industrial Engine Service; LUBBOCK, TEXAS, Conley-Lott-Nichols Machinery Co.; SAN ANTONIO, TEXAS, The Roy Klossner Company; BAKERSFIELD, CALIFORNIA, Glenn Rose Engine Service; ODESSA, TEXAS, Conley-Lott-Nichols Machinery Co., ODESSA, TEXAS, Harries Sales & Rental, P. O. Box 1568; LONGVIEW, TEXAS, Nichols Machinery Co.

TULSA, OKLAHOMA, SALES, PARTS AND SERVICE—111-117 S. ELWOOD ST.



Precision assembly in the shop prior to shipment expedites construction in the field. Cranes and other facilities are available at Newport News for complete assembly of weldments of almost any size to meet the customer's requirements.

Shipbuilder "launches" new vessel

It's a pressure vessel in an overseas petroleum refinery. And it caps *sixty-seven* years' experience by the Newport News Shipbuilding and Dry Dock Company. Sixty-seven years, building just about any kind of vessel you could name. And at a price.

They've fabricated millions of tons of steel. They handle weldments in almost any size or shape. They machine, weld and stress relieve.

Another development: fabrication of corrosion-resistant alloy, clad, and other special steels. You know how important they are today.

What's more, there's plenty of equipment — foundry, machine shop, fabrication and erecting — to build anything from a cat cracker to a bubble tray. And enough engineering skill and shop force experience to handle the job as you want it done. And at reasonable cost.

It would pay you to ask yourself, "What could Newport News build for us?" Find the answer in the brief, easy-to-read, photo-and-caption pages of *Facilities and Products*. See for yourself what Newport News is doing. And what equipment they use.

Send for *Facilities and Products*, free, today!

NEWPORT NEWS

SHIPBUILDING AND DRY DOCK COMPANY
Newport News, Virginia

SpringKore

Unretouched photograph of section of J&L SpringKore rotary drilling line worn out in service. Strand removed to expose coiled steel spring core. Note that core looks just like it did the day the rope was made except for faint indentations where wires of the inner strands nested against it for countless ton miles.

AN OBVIOUS IMPROVEMENT IN ROTARY DRILLING LINES

You can see and understand the difference.

The spring center makes this rotary drilling line resist high-speed bending and crushing.

Too, a crush-free center packed with the right lubricant is a decisive advantage.

The center from a section of J&L SpringKore worn out in service is just as round and crush-resistant as ever.

Ask any J&L man for more interesting details.

J&L STEEL

Jones & Laughlin
STEEL CORPORATION
SUPPLY DIVISION – TULSA, OKLAHOMA
Serving The United States and Canada

106-S

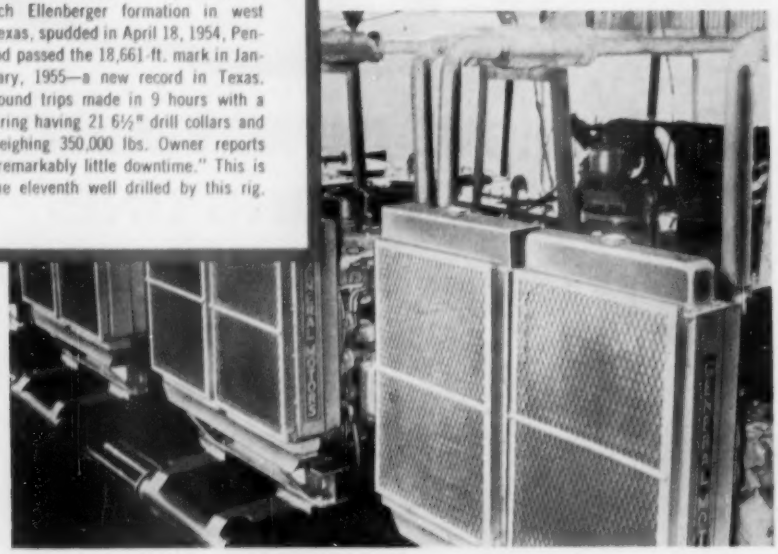
GM DIESEL
CASE HISTORY No. 1D2-11

OWNER: Penrod Drilling Company, Shreveport, La.

INSTALLATION: 4 GM Twin "6-71" engines powering Brewster N-12 1500-horsepower "golden rig," with Lee C. Moore jackknife mast and two Wilson-Snyder 20" mud pumps.

PERFORMANCE: In deep-well test of rich Ellenberger formation in west Texas, spudded in April 18, 1954, Penrod passed the 18,661-ft. mark in January, 1955—a new record in Texas. Round trips made in 9 hours with a string having 21 6½" drill collars and weighing 350,000 lbs. Owner reports "remarkably little downtime." This is the eleventh well drilled by this rig.

Texas Depth Record Broken by GM Diesel-Powered Rig



DEWEY DAVIS, drilling superintendent for Penrod, will tell you it takes the *right* equipment, *good* crew work and *dependable* power to achieve a deep-well record like this.

And for big rigs that combine operating economy with portability, General Motors Diesel power is your best choice. Here are five reasons why:

1 **Low first cost**—as a result of General Motors' famous mass-production methods.

2 **Low fuel consumption**—unit injectors and blower scavenging mean more power from each gallon of fuel.

3 **Faster trips**—two-cycle design with power on every piston downstroke makes GM Diesel engines faster-accelerating.

4 **Quicker moves**—GM Diesels are more compact and weigh less than 4-cycle Diesels of comparable power rating.

5 **Service and parts availability**—no matter what out-of-the-way location you drill in, GM Diesel parts and service are never far away.

Want to make hole at less cost? Ask your General Motors Diesel distributor for a free power survey, or write direct to us.

DETROIT DIESEL ENGINE DIVISION
GENERAL MOTORS • DETROIT 28, MICHIGAN

GM GENERAL MOTORS DIESEL POWER

Single Engines . . . 30 to 300 H. P. Multiple Units. . . Up to 893 H. P.

GENERAL MOTORS CORP., DIESEL ENGINE SALES, PETROLEUM INDUSTRY, 1504 PHILTOWER BLDG., TULSA, OKLAHOMA

ALABAMA—
Albertville, Birmingham, Montgomery
ARMSTRONG EQUIPMENT CO.

CALIFORNIA—Bakersfield
LAWLESS BROTHERS, INC.
Berkeley
WEST COAST ENGINE & EQUIPMENT CO.
El Cajon
DEAKINS-LANE DIESEL CO.
Los Angeles
ANDERSON-O'BRIEN CO.
Ventura
GEM EQUIPMENT CO.

COLORADO—Denver
THE COLORADO BUILDERS' SUPPLY CO.

ILLINOIS—Mt. Carmel
WESTERN SERVICES

KANSAS—Great Bend, Wichita
DIESEL EQUIPMENT CO.

LOUISIANA—Alexandria
UNITED TOOL CO.
Harvey
GEORGE ENGINE CO., INC.
Shreveport
UNITED TOOL CO.

MICHIGAN—Detroit, Grand Rapids
EARLE EQUIPMENT CO.

MISSISSIPPI—Jackson
TAYLOR MACHINERY CORP.

MISSOURI—St. Louis
WESTERN MACHINERY & ENGINE CO.

NEW MEXICO—Albuquerque
HARRY CORNELIUS CO.

NORTH DAKOTA—Williston
SWEENEY BROTHERS

OKLAHOMA CITY—Oklahoma City, Tulsa
DIESEL POWER CO.

TEXAS—Corpus Christi, Dallas, Houston, Lubbock, Odessa, San Juan
STEWART & STEVENSON SERVICES, INC.
Plainview
DIESEL POWER, INC.

UTAH—Moab, Salt Lake City
CATE EQUIPMENT CO., INC.

WYOMING—North Casper
WESTERN OIL TOOL & MFG. CO., INC.

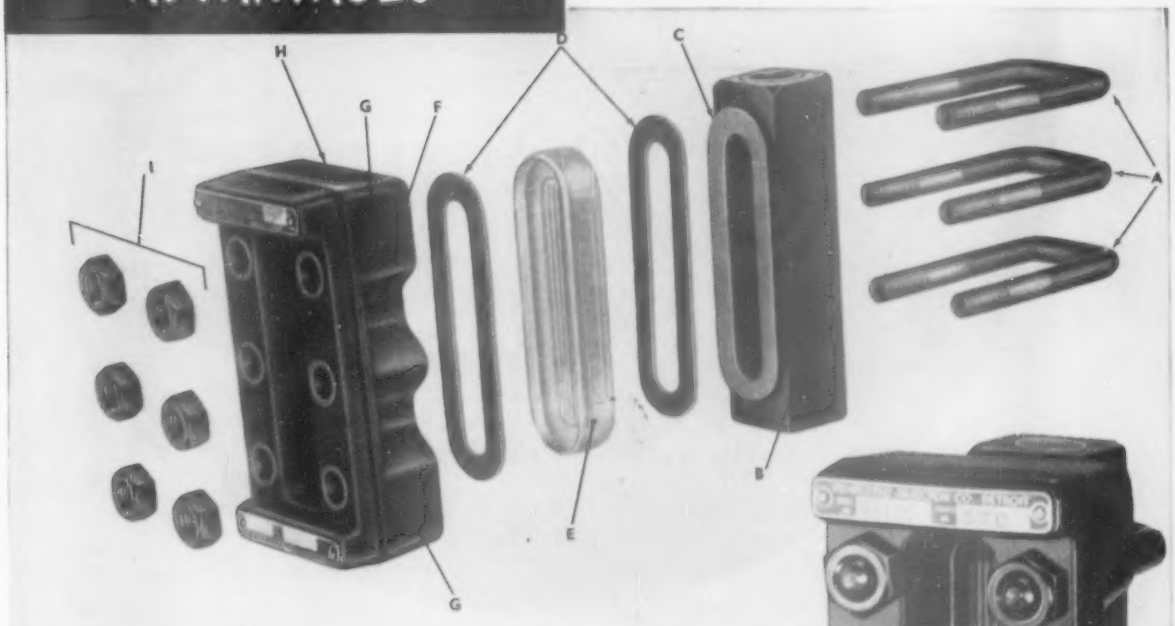
IN CANADA—Distributors in all key locations, under
GENERAL MOTORS DIESEL, LTD.
London, Ontario

HERE'S WHY PENBERTHY REFLEX GAGES OFFER EXTRA ADVANTAGES

CLEAR, ACCURATE LIQUID-LEVEL READINGS
in all tanks, boilers, vessels, containers and flow lines.

PENBERTHY REFLEX GAGES TYPE V & S

- **A** Alloy Steel Bolts for high temperature service
- **B** Alloy Steel Liquid Chamber heat treated to prevent warping
- **C** Raised Face on Liquid Chamber insures perfect self-alignment of frame with glass and gasket
- **D** Special Composition Gaskets and Cushions are interchangeable
- **E** Resilient Band around glass centralizes it at assembly
- **F** Drop Forged Steel Frame extra heavy and rigid
- **G** Extra heavy beam at end of Frame (prevents distortion when bolts are tightened to meet high pressure service)
- **H** Frame overlaps liquid chamber at all points — provides full backing for the gasket preventing blow-outs
- **I** Alloy Steel accurately threaded nuts

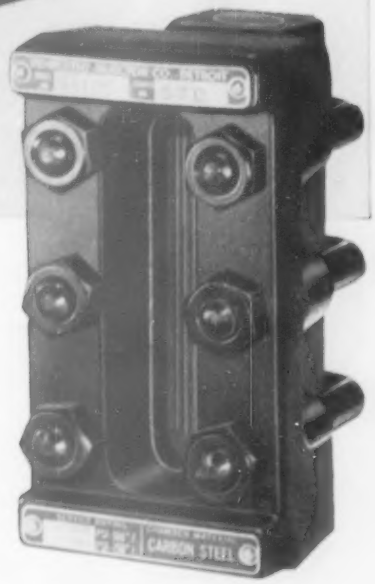


RAISED FACE *IS EXCLUSIVE FEATURE*

The construction of a Penberthy Gage invites comparison to prove superiority. Note especially the easy glass or gasket replacement and glass cleaning made possible by the fully accessible RAISED FACE. Perfect alignment of frame with glass and gasket is assured. Gasket surface can be repaired without removing assembly from vessel.

Designed for temperatures ranging from sub-zero to over 1000° F. and for test pressures exceeding 15,000 psi., Penberthy gages are used extensively for liquids ranging from water to highly corrosive and dangerous chemicals.

Available in a wide variety of materials including bronze, iron, carbon steel, stainless, monel, etc.



WRITE for Catalog No. 35. *Order through your jobber or direct.*

PENBERTHY INJECTOR COMPANY
Division of the Buffalo-Eclipse Corporation
1242 Holden Avenue, Detroit 2, Michigan

- GAGES
- EJECTORS
- EDUCTORS
- EXHAUSTERS
- SYPHONS
- ELECTRIC SUMP PUMPS
- CYCLING JET PUMPS
- INJECTORS

There's Certain Satisfaction in **PRODUCTS BY** PENBERTHY

Now... your own painter can "COLD-GALVANIZE" any steel surface with

DIMETCOTE

* the 100% inorganic zinc coating

any PLACE

any TIME

any WHERE

SPRAY or BRUSH

Dimetcote is absolutely unique. It is not a paint, it contains no oils, resins or any other organic materials, yet it can be applied by spray or brush. When Dimetcote is applied to steel, a reaction takes place at the surface which produces chemical bonding as well as physical adhesion. It is almost impossible to find the interface between Dimetcote and the steel.

Dimecote has many unusual characteristics. It shows no visible change after more than ten years exposure to the most severe weather conditions – sun, heat, fresh and salt water. It is insoluble in all solvents and petroleum products. It is highly abrasion resistant, but if abraded through to bare steel, the coating will cathodically inhibit corrosion.

Now tanks and structures can be given the same protection that galvanizing affords, *plus salt water resistance*. Existing structures need not be dismantled and new structures can be coated either before or after erection. *Only one coat* of Dimetcote over a sandblasted surface is required to protect such structures as:

Tank Exteriors • Cargo Tanks in Tankers • Dam Gates • Structural Steel • Christmas Trees • Buoys • Floating Roof Tanks • Offshore Rigs • Water Tanks • Barges • Ship Decks • Stacks

Write for the Dimetcote Technical Bulletin today.

Follow the line of MOST resistance:

Amercoat® CORPORATION

4809 Firestone Blvd.,
South Gate, California

Evanston, Ill. • Kenilworth, N. J. • Jacksonville, Fla. • Houston, Tex.

Like SALT

ALL BOLTED STEEL TANKS MAY LOOK ALIKE

BUT *M-C Bolted Steel Tanks...*

Service in Tank Erection Around the Clock and Around the Year...

Maloney-Crawford experienced erection crews are on duty 24 hours a day throughout the year to assure tank erection immediately when it is needed at sales and service points.

Sales and Service Points

have over 40 years of experience (since Maloney Tank Company built the original steel tank) built into them. There is no substitute for experience and there is no comparable substitute for M-C bolted steel tanks. 40 years of engineering and building experience plus the best in craftsmanship and materials guarantee top quality when you buy Maloney-Crawford bolted steel tanks.

Call one of our offices at: OKLAHOMA—Ardmore, Cushing, Duncan, Lindsay, Oklahoma City, Tulsa; TEXAS—Corpus Christi, Dallas, Ft. Worth, Houston, Midland, Odessa, Pampa, San Angelo, Wichita Falls; LOUISIANA—Lafayette, New Orleans; NEW MEXICO—Hobbs; COLORADO—Brush, Denver, Fort Morgan; MONTANA—Glendive; CANADA—Calgary, Edmonton, Regina, Swift Current, Virden.

MALONEY-CRAWFORD TANK & MANUFACTURING CO.

FACTORY AND GENERAL OFFICE: 38 North Peoria—Box 659—Tulsa, Oklahoma
EXPORT REPRESENTATIVE: Baird Lines, 420 Lexington Avenue, New York, N. Y.
CANADIAN REPRESENTATIVE: Maloney-Crawford Tank & Service Company, Ltd., Edmonton, Alberta
TEXAS PANHANDLE REPRESENTATIVE: Atlas Tank Company, Pampa, Texas

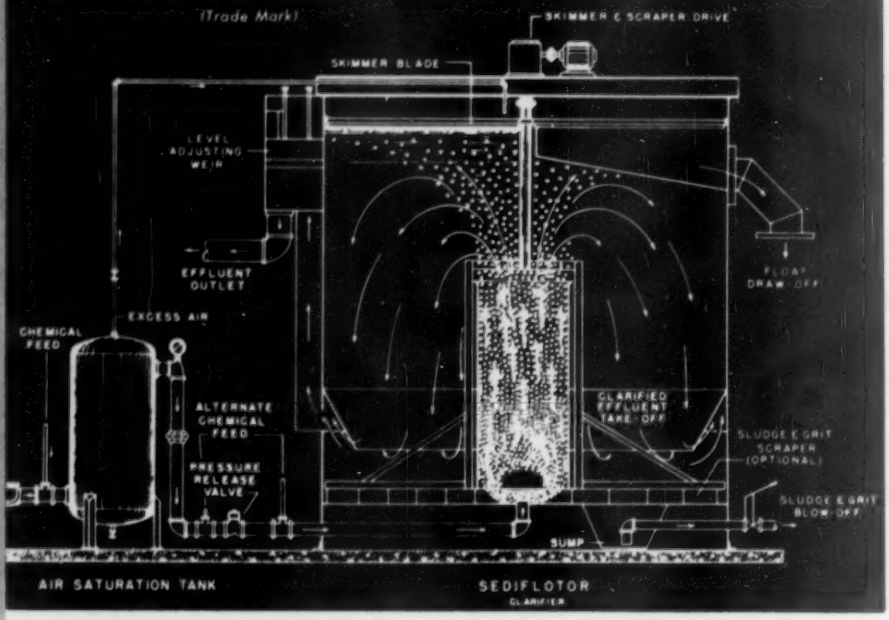
MALONEY-CRAWFORD TANK & MFG. CO.

NOW INFILCO ... LEADER IN WASTE-TREATMENT EQUIPMENT ENGINEERING presents the

SEDIFLOTOR Clarifier

(Trade Mark)

versatile new 2-in-1 flotation unit



1. "DISSOLVED-AIR FLOTATION" assures rapid removal of suspended material from waste waters. Here is new efficiency for removing contaminants such as oils, greases, light fibrous materials, etc. Based on the principle of "dissolved-air flotation"— and incorporating reliable chemical feed and operating control, the "SEDIFLOTOR" Clarifier is the answer to many waste problems.

2. GRAVITY-SETTLING CLARIFICATION is included. "SEDIFLOTOR" Clarifier design provides the most modern type of gravity-settling equipment, so that both light and heavy materials are removed rapidly and effectively.

Faster... flexible... economical... dependable

Proved by exhaustive test, "SEDIFLOTOR" Clarifier offers marked advantages. The combination of flotation and gravity-settling results in extremely fast and efficient cleansing of waste waters from refineries, packing houses, paper mills, sewage plants (where large amounts of grease and oil are present), chemical and food plants and other similar sources.

It is readily adaptable for use with other equipment, and may be designed for literally any desired flow, with provisions for use of chemical agents, and continuous removal of floating scum and settleable solids.

Quite automatic, the "SEDIFLOTOR" Clarifier operates with maximum economy and requires only periodic attention.

Waste Samples Invited

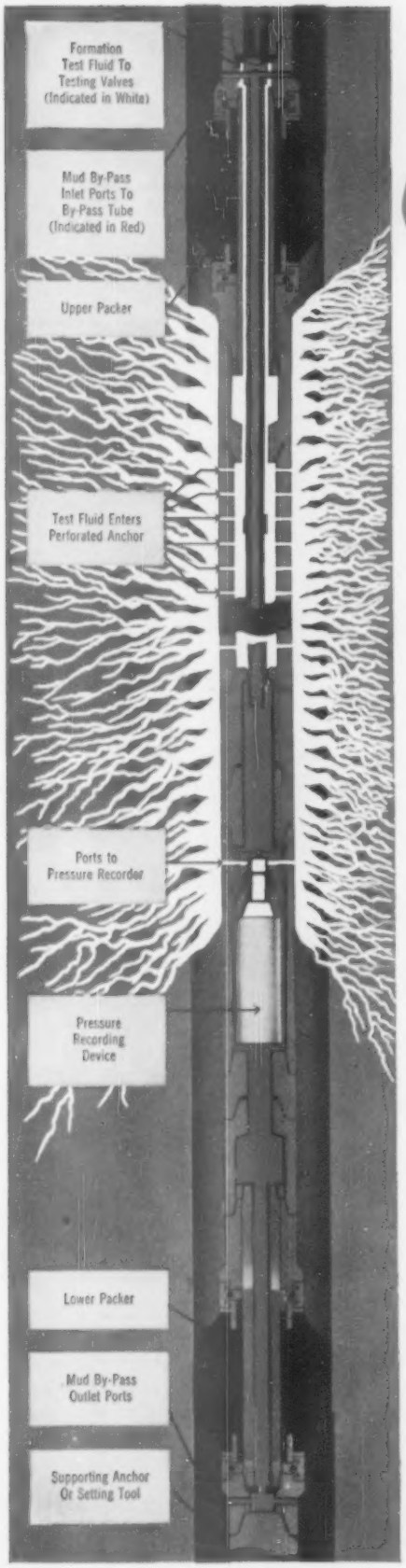
Our laboratory is equipped to test samples of waste water to determine suitable methods and proper size of equipment for your needs. Your inquiry is invited and should include general description of your problem.

INFILCO

The one company offering engineered equipment for all types of water and waste processing— coagulation, precipitation, sedimentation, flotation, filtration, ion exchange and biological treatment.

INFILCO INC. 915 South Campbell Ave., Tucson, Arizona
Field offices in principal cities in North America

5620C


Formation Test Fluid To Testing Valves (Indicated in White)
Mud By-Pass Inlet Ports To By-Pass Tube (Indicated in Red)
Upper Packer
Test Fluid Enters Perforated Anchor
Ports to Pressure Recorder
Pressure Recording Device
Lower Packer
Mud By-Pass Outlet Ports
Supporting Anchor Or Setting Tool

Straddle Testing

in open hole

another Johnston first*

Now, with complete confidence, you can...

- EVALUATE UP-THE-HOLE ZONES
- LOCATE GAS, OIL, AND WATER CONTACT
- HELP PROTECT HOLE AND SUPPORTING ANCHOR

See how Johnston Straddle Testing with STRADDLE MUD BY-PASS maintains full hydrostatic mud pressure on upper and lower packers—and on all formations below lower packer. Lessens the load on supporting anchor and prevents production from any lower zone in the event of lower packer failure. Should either packer fail, you get an immediate surface indication. Get all these advantages plus ease of running tool into and out of the hole.

*Johnston Straddle Testing with Straddle Mud By-Pass is covered by patent and patents pending. Another Johnston first!

for descriptive folder write to:

JOHNSTON TESTERS

first in drill stem testing

P. O. Box 98,
HOUSTON, TEXAS

LOS ANGELES, CALIF. • CALGARY, CAN.

FORMATION AND CASING TESTING — JOHNSTON

AN IMPORTANT MESSAGE CONCERNING...

A Basic Advance In Motor Insulation

ELECTRIC motor and generator insulation has come in for its share of announcements of "new" and "revolutionary" developments. But in spite of these announcements, inherent shortcomings of conventional insulation have remained.

There has been little basic improvement in motor insulating systems . . . UNTIL NOW.

Allis-Chalmers, working with engineers and scientists of Dow Corning Corporation, has developed *Silco-Flex* motor insulation . . . truly new in concept . . . truly new in effectiveness.

The *Silco-Flex* insulation system employs a pure silicone rubber combined with specially developed application techniques to produce an insulation unmatched by any other in use today. Outstanding improvements are shown in all these important characteristics:

Homogeneity — The complete *Silco-Flex* coil insulation is vulcanized into a single piece with no joints, voids or splices which can develop into breaks in the insulation. Even the best of the new conventional insulations combine several dissimilar materials which are held together by binders.

Heat Resistance — The excellent dielectric and mechanical properties in silicone rubber do not change significantly with aging at high temperatures over long periods of time.

Moisture Resistance — Completely sealed, *Silco-Flex* insulated coils are the most moisture-resistant coils ever produced.

Chemical Inertness — *Silco-Flex* insulation has outstanding resistance to most atmospheric contaminants, corona and weathering. It also withstands weak acids, alkalies and lubricants.

Flexibility and Resilience — *Silco-Flex* insulation remains flexible and resilient indefinitely under operating conditions. It is especially resistant to mechanical abuse and to the stresses brought about by overloading and rapid starting and stopping. It is also amazingly resistant to abrasion.

Heat Dissipation — Most electric insulators, unfortunately, are also heat insulators. *Silco-Flex* insulation, by comparison, is an excellent heat conductor and materially assists in removing heat from the coils.

What Are the Benefits?

The characteristics of this new insulation are so remarkable that complete reappraisal of motor application practices and motor performance is indicated.

In *all* applications, the chemical, mechanical and electrical properties of *Silco-Flex* insulation insure increased service reliability and longer life.

In addition, this new insulation system may reduce or eliminate the need for special motor enclosures. Atmospheres contaminated with cinders and fly ash, for instance, will have little effect on *Silco-Flex* insulated windings. Similarly, abrasive dusts in steel mills will not harm this insulation. Savings through the use of open, instead of totally-enclosed, frames will also be possible in chemical, paper, food and other industries where water or corrosive atmospheres are a problem.

What About Availability?

New *Silco-Flex* insulation is immediately available for all Class H form-wound coils and for Class A and B windings. operating under selected service conditions.

For complete information on SILCO-FLEX ***insulated motors, see your Allis-Chalmers representative or write Allis-Chalmers, Milwaukee 1, Wisconsin.*** A-4664

Silco-Flex is an Allis-Chalmers trademark.

ALLIS-CHALMERS

NOW

IBM 650 BRINGS ELECTRONIC SPEEDS TO REFINERY ENGINEERING CALCULATIONS

"Calculated risks" are now being eliminated from management decisions in an increasing number of petroleum refineries. With the split-second computing speeds and accuracy of the new IBM 650, management can have more complete data for vital decisions in *less time* than was ever before possible!

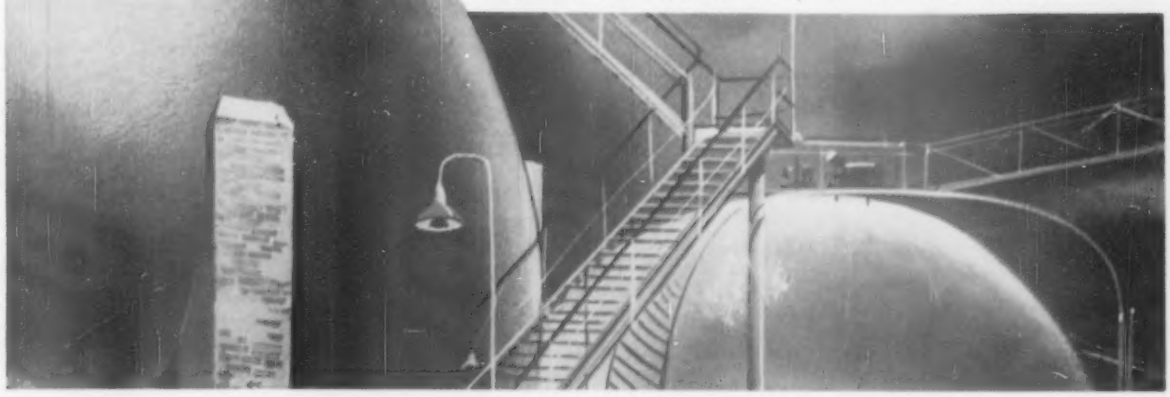
Hard at work for these forward-looking companies, the IBM 650 is slashing days, and even weeks, from routine experimental calculating jobs, such as *catalyst research, reactor design, gasoline blending, crude oil analysis,* and *refining process development.* Trained engineers, now relieved of tedious calculating jobs, have more time for creative thinking. The result . . . more profitable operating techniques and schedules!

For years, IBM electronic equipment has been saving hours and dollars for the petroleum industry in all phases of production and refining, engineering and research, as well as accounting. Now, more and more IBM 650's are being installed to bring even *greater* economies. Call your local IBM representative for details on how IBM Data Processing can fit *your* needs.

IBM DATA PROCESSING

WORLD'S LARGEST PRODUCER OF DATA PROCESSING MACHINES

International Business Machines Corporation, New York 22, N. Y.



PLAN YOUR PROCESS PIPING for

MAXIMUM SERVICE and SAFETY with . . .

WATSON-STILLMAN
Socket-Welding
FORGED STEEL FITTINGS

In high pressure steam lines...process liquid and gas piping...hydraulic fluid lines...wherever strong, tough pipe joints are needed, Watson-Stillman Socket-Welding Fittings provide a safety factor against costly piping failures. Drop-forged of high quality steel, they readily resist pressure, heat, corrosion, shock and vibration.

W-S Socket-Welding Fittings are easy to install. Deep sockets support and align the pipe for welding. No need for tack welding or special fixtures. And the outside-the-pipe fillet weld prevents welding icicles inside the pipe.

Watson-Stillman Forged Steel Fittings are available in carbon, stainless and alloy steel for Schedule 40, 80, 160 and XX pipe. Sizes ⅛" to 4". A complete line of forged screw-end fittings is also available.. Send today for Free catalogs.

Sold Through Leading Distributors

W-S WATSON-STILLMAN FITTINGS DIVISION

HKP H. K. PORTER COMPANY, INC.

Roselle, New Jersey 11

They Say—

Why We Need Imports

"Gulf frequently is referred to as 'one of the international oil companies' . . . I would like to call your attention to the fact that our major interests and investments are, as they always have been, in the United States.

"Our primary objective in seeking crude oil outside the United States was—and still is—to protect our ever-increasing investments in domestic refineries and markets. Our successful endeavors in foreign oil production . . . are above all a guarantee of protection for our domestic operations.

"U. S. oil consumption is rising at a much faster rate than domestic proven reserves. During the decade 1943-52, U. S. consumption rose 83 per cent while proven reserves increased only 44 per cent. . . .

"The industry has been finding more crude in the U. S. than the nation has been consuming, but the margin is narrowing and last year it practically disappeared. Had it not been for imports and utilization of inventories previously accumulated, there would have been no increase in U. S. reserves of crude oil and natural-gas liquids in 1954. . . . It seems fundamental . . . that if we are to maintain an ample level of domestic reserves, reasonable quantities of foreign oil must be brought into this country.

"We must never lose sight of the fact that while our nation accounts for over 60 per cent of the free world's oil consumption, it has only 20 per cent of the proved oil reserves, and unquestionably a much smaller proportion than that of the potential or undiscovered reserves."

W. K. Whiteford, president, Gulf Oil Corp., in a statement at the company's annual meeting of shareholders.

U. S.'s Reserve Producing Capacity

"The petroleum industry has done an amazing job of developing reserve producing capacity. We now have more available at the turn of a valve than at any time since our entry into World War II.

"However, according to the best estimates of the military which we have

"Our Cardwell Model D's

DRILLING WORKOVERS

HOWARD PARKER COMPANY
SAN JACINTO BUILDING
PReston 9127
HOUSTON 2, TEXAS

November 11, 1954

Mr. H. W. Cardwell
Cardwell Manufacturing Company, Inc.
P. O. Box 2001
Wichita 1, Kansas

Dear Mr. Cardwell:

For your information and your files, we are enclosing herewith, certain compiled data relative to the operation of our two Cardwell Model "D" Rigs, in which we feel you will be interested.

As you know, our first Model "D" was delivered on January 1, 1954, and in the past ten month period this rig has drilled, with 4½" drill pipe, an accumulated footage of 71,300 feet of hole, comprised of the following:

	One	7,700 foot hole
	One	7,200 foot hole
*	Two	6,700 foot holes
	Three	5,500 foot holes
	Five	5,300 foot holes

The total number of trips involved in making this amount of footage was 164 with drill pipe and 25 with tubing.

Our second Model "D" Rig was delivered to us on May 10, 1954. This rig has drilled, with 4½" drill pipe, an accumulated footage of 35,000 feet of hole, comprised of the following:

	One	8,992 foot hole
*	One	8,445 foot hole
	One	7,850 foot hole
	One	6,000 foot hole

In the drilling of these four wells, two were side-tracked and directionally drilled. The total number of trips involved in the drilling of this 35,000 feet of hole was 120 with drill pipe and 8 with tubing.

We are impressed, not only by the smooth operation of these rigs, but doubly so by the small amount of down time due to repairs, which is practically negligible. Our men class them as the best in the field in their capacity.

Yours very truly,

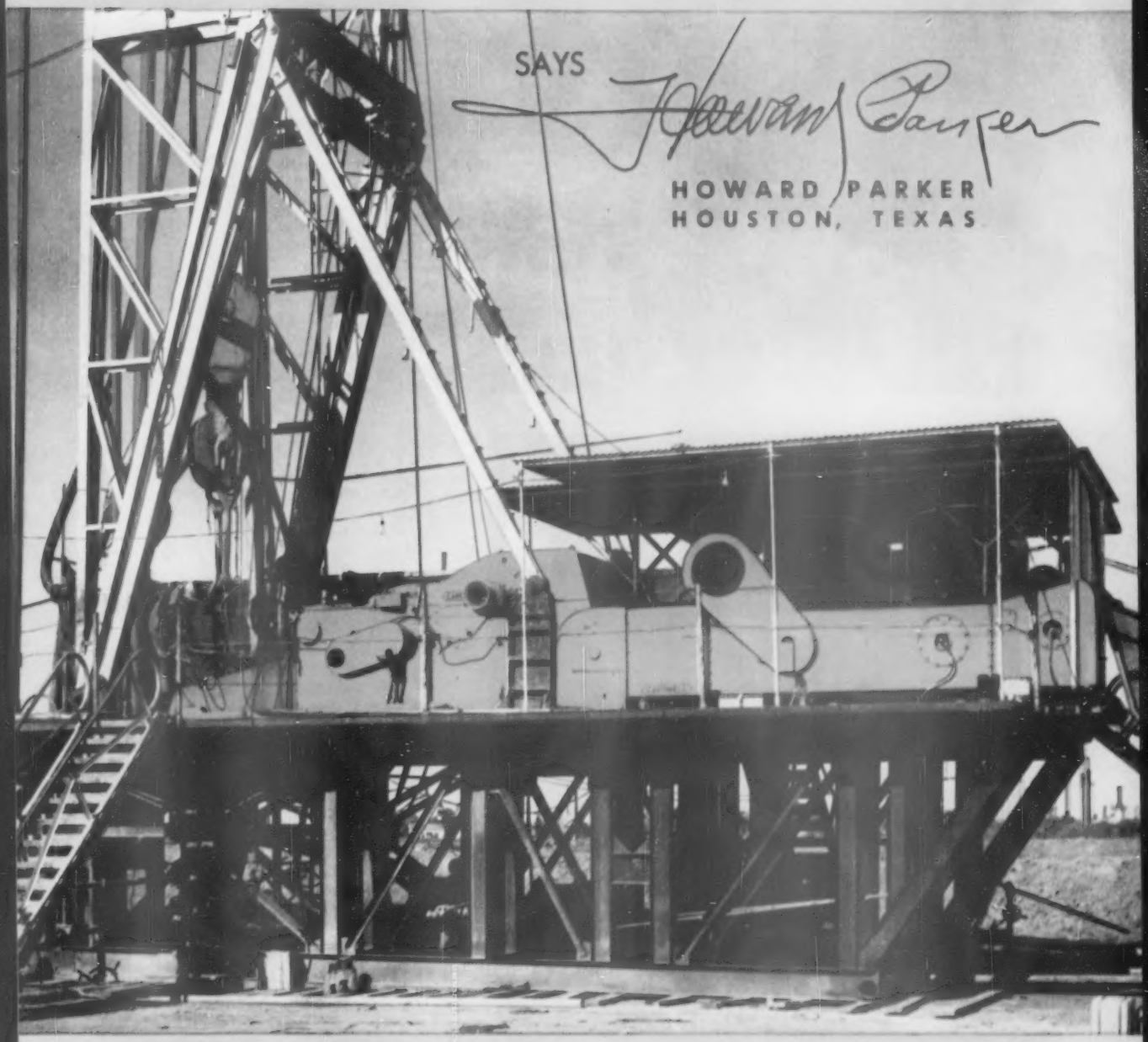
HOWARD PARKER COMPANY

By Howard Parker

HP/lr
Encls.

* MODEL D IS RECOMMENDED FOR DRILLING TO 5,000 FEET WITH 4½-INCH DRILL PIPE

are the best in the field"



FEATURES OF THE CARDWELL MODEL D...

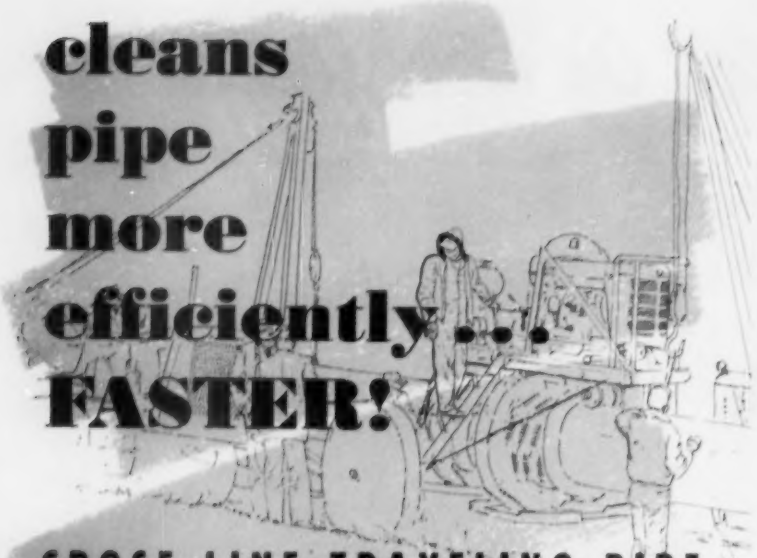
Furnished as a single- or double-drum rig, with one or two engines. The special Cardwell friction clutched chain transmission provides four instantly available forward speeds and one jaw clutched reverse to the drum and rotary table. Friction clutches inside the transmission case control the shifting of each forward speed and eliminates stopping to change speeds. Cardwell air friction clutches are used in drum ends, transmission, rotary drive and mud pump drive. Draw works is lightweight and compact, and moves with engines in place. Write or wire for full information, or see your nearest Cardwell representative.

CARDWELL
REG. U. S. TRADE MARK PAT. OFFICE
THIS TRADE MARK INSURES HIGHEST QUALITY AT LOWEST PRICE

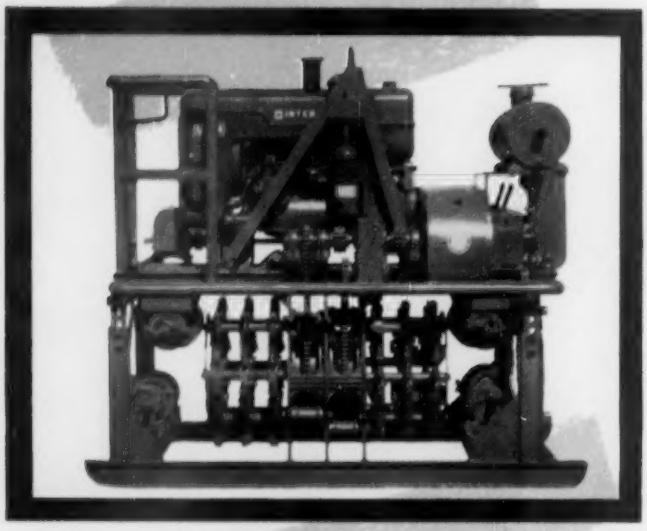
CARDWELL MFG. CO. INC.
P. O. Drawer 3001 — Long Distance Telephones 128—129—130
Cable Address "ALL STEEL" Wichita — "CARDSTEEL" New York
Wichita, Kansas, U. S. A.

THERE IS A CARDWELL PARTS STOCK NEAR OR IN EVERY OIL FIELD OF THE WORLD

cleans pipe more efficiently... FASTER!



CROSE LINE TRAVELING PIPE CLEANING AND PRIMING MACHINE



This versatile pipe cleaning and priming machine can be used for line traveling operation or with stationary base (shown above) for yard cleaning and priming—either way it is better built and more efficient to give you faster, trouble-free service. Crose cleaning and priming machines are available for all sizes of pipe including 36".

m.j. Crose
MANUFACTURING COMPANY, INC.
2715 DAWSON ROAD • PHONE 6-2172 • TULSA, OKLAHOMA
15225 EAST COLFAX AVENUE, AURORA, COLORADO • 500 FIFTH AVENUE, NEW YORK CITY
DISTRIBUTORS:
CROSE-CURRAN LTD., EDMONTON • CROSE PIPELINE EQUIPMENT CO., INC., NEWARK, N. J. • PIPELINE SUPPLY CO., HOUSTON

been able to obtain, our present huge reserve producing capacity is still not entirely adequate to meet the demands of this nation come a military emergency, even if no present source of foreign supply is impaired.

"But when we realize that in the event of war, most foreign sources of oil, particularly those in the Middle East, are almost certain to be cut off from us, then we must recognize that our present reserve producing capacity is only barely sufficient to offset the loss of foreign imports without any remaining to meet the expanded needs occasioned by the emergency."

William J. Murray, Jr., chairman, Texas Railroad Commission, in an address before the Independent Petroleum Association of America meeting in San Antonio.

Inspecting Pipelines

Dear Sir:

We have read with great interest your article on "Radiographic Weld Inspection" starting on page 147 of the March 14 issue of The Oil and Gas Journal. We want to congratulate you on this very fine article and in particular on your emphasis of the need for high quality radiographic pipeline inspection.

We would, however, like to call to your attention the last paragraph on page 151 on weld standards in which paragraph a reference to the widely adopted A.P.I. Standard 1104 would have greatly added to the value of this article. Also, in the second paragraph on page 152, reading "Radiographing with the source and film outside . . ." we feel that using an interpretative film length greater than is allowed in A.P.I. Standard 1104, regardless of the radiation source, will produce distortion and inadequacies which will defeat the purpose of radiographic inspection.

Other than in the two above-mentioned corrections we are heartily in agreement with this article on radiographic inspection and feel that it is a valuable addition to published information in the field of nondestructive testing.

R. G. Strong
Chairman
A.P.I.-A.G.A. Joint Committee on Oil and Gas Pipeline Field Welding Practices.

Imperial and Imports

"Our main concern at present is the effort of some groups in the United States to bring about legislated restrictions of crude-oil imports.

"In view of the fact that the U. S. consumes two-thirds of the oil produced in the free world and contains only about one-fifth of the proved oil reserves, we find it hard to understand

THIS TRADE MARK INSURES HIGHEST QUALITY AT LOWEST PRICE
Cable Address "ALL STEEL" Wichita — "CARDSTEEL" New York
Wichita, Kansas, U. S. A.
IN EVERY OIL FIELD OF THE WORLD

SINKER BARS — Smooth bars in 5', 10' or 20' standard lengths in 1½" or 1¾" O.D.

TUBULAR JARS — Heavy duty with forged upset stop collar. Has full 20" or 30" stroke and provides both knuckle and swivel action. 1¾" O.D., ⅞" rod.

SWIVEL JOINTS — Hollow or solid. Swivel knuckle action allows cup to center in tubing, adds life to swab cup by equalizing wear.

OVERLOAD RELIEF VALVE — Prevents stuck swabs by dumping excess fluid when swab is overloaded. Replaces regular swab valve body. Can be field adjusted to recover desired column of fluid. For 2", 2½" or 3" tubing.

ROPE SOCKETS — Plain or swivel, for all rope sizes through ¾". Top half is interchangeable on plain or swivel rope sockets and swivel rope socket joint.

For the BEST SWAB JOB use the BEST SWAB ACCESSORIES

SINKER BAR | TUBULAR JAR | HOLLOW SWIVEL JOINT | SOLID SWIVEL JOINT | SWIVEL ROPE SOCKET JOINT | OVERLOAD RELIEF VALVE | PLAIN ROPE SOCKET | SWIVEL ROPE SOCKET

Guiberson swabs are the best made ...they deserve the best accessories!

THE
GUIBERSON
CORPORATION

ESTABLISHED 1919 • DALLAS, TEXAS, U. S. A.

Sold By Leading Oil Field Supply Stores Everywhere

What's it take to Sell

A Truck Body?

"WITH ME IT'S STRICTLY PRICE!" . . . then Leland's Packaged Unit is definitely for you! The gin pole design coupled with a heavy duty behind-the-cab winch (furnished at your option) plus many other exclusive features make the Packaged Unit adaptable to a multitude of different trucking jobs. You cut expenses by eliminating unnecessary equipment.

"IT'S GOT TO LAST, BROTHER!" . . . that's true of you and a lot of others, friend. Trucks take a rough beating and that's why Leland has used sturdy materials and reinforced design throughout. The Packaged Unit is streamlined with flush-mounted gin pole pocket settings, recessed snatch block toggle, and flush-mounted body deck plate. The simplicity of design eliminates breakdown even under the most rugged use.

"I'VE GOT TO HAVE SAFETY!" . . . yes, that's right — there are a lot of green hands working today's equipment. Though they mean well they often make costly safety mistakes. But you can stop worrying. Special design features of the Packaged Unit such as the manual locking devices in the tailboard and the heavy duty drill pipe headache rack drastically reduces the chances for a serious accident.

AND YOU'LL FIND THIS SAME QUALITY DESIGN AND FABRICATION IN LELAND'S POLE TRAILERS . . . SINGLE AND TANDEM AXLE SELF-LOADING FLOATS . . . FIFTH WHEEL BODIES . . . DUMP BODIES . . . SERVICE BODIES . . . PLATFORM BODIES . . . LOW BED TRAILERS.

Leland
EQUIPMENT COMPANY
Oklahoma City • TULSA • Longview, Texas

Meet your **production**
EQUIPMENT SPECIALISTS
in **Oklahoma**

When you need equipment for your next well, call your Union Tank sales and service man. DAY OR NIGHT, his years of experience are available to help you solve the production equipment problems on your leases. This service, combined with dependable Union Tank production equipment means a more profitable operation to you. That's why it will pay you to know the following men:

A. F. Nixon
Regional Manager
Fort Worth, Texas

P. H. Westerman
Branch Manager
Oklahoma City, Okla.

R. J. Garnett
Ardmore, Oklahoma

W. H. Christopher
District Sales Manager
Tulsa, Oklahoma

C. B. Stanley
Tulsa, Oklahoma

When your next well comes in, call Union Tank for fast, skillful service with dependable follow up on . . .

Welded steel tanks	Indirect heaters
Bolted steel tanks	Emulsion heaters
Wood tanks	Heater tanks
Stairways, walkways	Heater-treaters
Texsteam pumps	Cold sep. & dehyd. units
Vertical separators	Valves and regulators
Horizontal separators	Loading racks

UNION TANK AND SUPPLY COMPANY
P. O. Box 2092, Houston, Texas
Subsidiary of Butler Manufacturing Company
Kansas City, Missouri

why such a measure should be urged, and harder still to believe that it will be sanctioned.

"Further, I understand there is a strong sentiment in the U. S. that the suggested legislation would be detrimental to relations with other countries, probably resulting in serious curtailment of trade, and that it would endanger national security . . . We are hopeful that this difficulty will be averted . . ."

J. R. White, president, Imperial Oil, Ltd., at the company's annual meeting in Toronto.

Canada's Shortcomings

"The . . . collapse of the all-Canadian gas pipeline project was inevitable because the Canadian Government's gas policy of nationalism ignored the basic laws of sound economics, and rejected so far as gas is concerned the policy of cooperation with the United States which our government now preaches in regard to crude oil.

"Our gas attitude, in fact, somewhat weakens Canadian arguments that our American neighbors should cooperate with Canada by keeping the border open to the economic, international movement of crude oil . . .

"Fortunately for Canada, the U. S. administration and the major segments of the American oil industry are . . . opposed to any curtailment of presently planned expansion of our oil exports across the border. I am confident there will be no interference by the U. S. to plans for progressively larger sales of Canadian oil into neighboring American markets, plans which are vital to the healthy growth of our western oil industry . . .

"Recent events . . . have brought into sharp focus facts which have been too much disregarded in Canada in recent years . . . Those facts are these:

"**. . . Economic factors,** not wishful thinking, make financing of pipelines and linking of oil and gas fields to market possibilities.

"**. . . Any departure from most-economic** planning for transport and marketing imposes a financial burden that must be carried by producers through lower prices, by consumers through higher costs, by taxpayers through some form of subsidy, or by spreading the burden among all three groups. Quite naturally, producers, consumers, and taxpayers all have normal objections to being stuck with the bill.

"**. . . With gas, as with oil,** our real problem is not shortage of these resources for Canadian needs, but rather a problem of mounting surpluses be-

"SCOT"

SEAMLESS

MINIMUM HARDNESS

RING GASKETS

For ring groove flanges forged from reforging billets in all stainless, chrome, monel, copper, extra low carbon steel. Machined in all A.P.I.-A.S.A., special sizes, and other types.

Available through your supply store.

SOUTHERN CALIFORNIA OIL TOOL COMPANY

8220 Atlantic Boulevard

P. O. Box 30, Bell, California

Adomite

A New Product With Big Possibilities — Continental Oil Co. has developed a new material—Adomite—which can be mixed in crude oil to lower the fluid loss so that the oil can be used as a fracturing fluid. Field tests have shown excellent results and the product has been placed on the market. The Chemical Process Co. distributes Adomite as part of our fracturing services.

When applicable, the use of crude oil rather than refined oil for fracturing offers substantial operating economies in addition to many completion advantages. By simply lowering the fluid loss, Adomite allows usual amounts of sand to be carried in thin crude oil without screening out. Thus without excessive fluid loss, the oil will afford a more extensive fracture. Lower injection rates also are possible, less equipment is required, wells clean up better and faster, and the sale of the oil is not affected.

The chances are that Adomite has an immediate place in the completion work you have under way. If you will write to The Chemical Process Co. in Breckenridge, Texas, or contact one of our many stations in the Mid-Continent area, we'll be glad to tell you more about Adomite and give you descriptive literature without obligation.

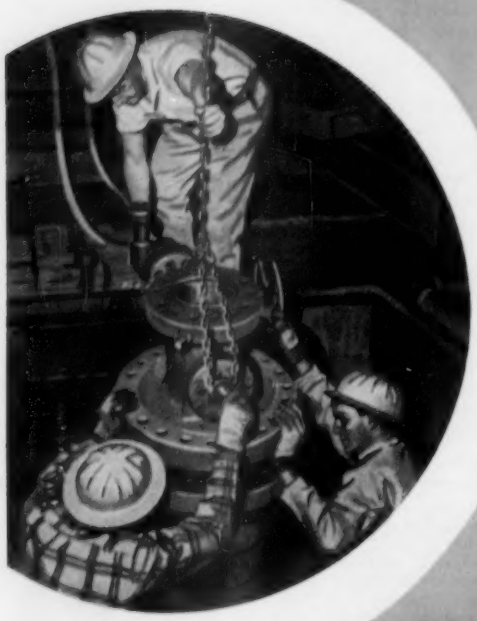
THE CHEMICAL PROCESS CO.

SERVICING OIL & GAS WELLS

ACIDIZING FRACTURING

ADOMITE IS CONTINENTAL OIL COMPANY'S NEW ADDITIVE TO CONDITION CRUDE OIL TO USE AS A FRACTURING FLUID

Service Unlimited



One of the men in this cellar is an O-C-T Service Man. Only a few hours earlier, he had been alerted for the job and he made it his business to get there without delay.

During the drilling and completion operations on every well, there comes a time when good service from your equipment supplier can save you money.

We can only guess how many thousands of dollars have been saved for the oil industry by prompt O-C-T service. But we do know this: Oil Center Tool Company maintains the largest service organization in the field to help you set and service wellhead assemblies.

It makes a good combination you can count on . . . the most dependable equipment plus the best service in the field.

OIL CENTER TOOL COMPANY WAREHOUSE AND SERVICE POINTS

Corpus Christi, Texas
Dallas, Texas
Houston, Texas
McAllen, Texas
Midland, Texas
Odessa, Texas
Victoria, Texas
Houma, La.
Lafayette, La.
New Orleans, La.
Shreveport, La.
Laurel, Miss.
Natchez, Miss.
Farmington, N. M.
Hobbs, N. M.
Williston, N. D.
Oklahoma City, Okla.
Casper, Wyo.
Calgary, Alberta, Canada
Edmonton, Alberta, Canada
Maracaibo, Venezuela
Anaco, Venezuela

O·C·T

OIL CENTER TOOL CO.

P. O. Box 3091, Houston, Texas

Export Representatives: Sterling Areas—Le Grand, Sutcliff & Gell, Ltd., Rochester, Kent, England. South America—East West Oilfields, C. A., Del Lago Hotel, Maracaibo, Venezuela. Address Export Inquiries for All Other Countries to P. O. Box 3091, Houston, Texas.

yond Canada's ability to economically consume.

". . . Continental rather than national planning . . . is dictated by the factors of geography, economics, and surpluses, plus the factor of mutual defense interests . . ."

Carl O. Nickle, member of Canada's parliament and publisher of the Daily Oil Bulletin, in an address before the Canadian Club of Toronto.

Refining Competition at Peak

"These better products require extensive improvements of refining equipment. The catalytic techniques that came into such prominence during World War II for cracking have now been extended to reforming and other processes that change the hydrocarbon molecules . . .

"The competitive pressures in the refining branch of the industry, which . . . reflect competition in the market place, are greater than ever before. Just what all this will mean to us financially is hard to say now. Certainly the company is going to have to spend more capital money in refining improvements than we had planned a year or two ago. Partly because of catalytic reformer construction, domestic refining capital expenditures will total about $47,000,000 in 1955, and the figure for 1956 will be considerably higher . . ."

B. Brewster Jennings, president, Socony Mobil Oil Co., Inc., at the company's annual meeting.

Canada's Soaring Gasoline Tax

"The lion's share of the total (tax revenue) was the $39,916,000 collected by the company in gasoline taxes. A brief reference was made to this subject last year and we expressed the hope that our governments would reduce, rather than increase, the high taxes then existing, which had already gone up over 50 per cent during the postwar period.

"The ever-continuing growth of this method of collecting revenue is disturbing. Within the past few weeks two provinces have announced plans for a further 2-cent-a-gallon increase in their taxes, making them 17 cents a gallon, the highest on the continent and, for example, 57 per cent higher than the highest such tax paid in the United States, and double the average gasoline tax paid in that country.

"In the recent budget, cars and tires were recognized as necessities of everyday life and the sales tax reduced on them. Gasoline manifestly is no less a necessity of everyday life, and yet the tax continues to increase on this commodity, with the result that our gasoline taxes in Canada now range up to 35 per cent of the price paid by the motorist for his produce and make it one of the most heavily taxed commodities in this country . . ."

J. Gerald Godsoe, executive vice president, British American Oil Co., Ltd., at the company's annual meeting in Toronto.

CALENDAR OF EVENTS

MAY

23-25 American Petroleum Institute, Division of Marketing, midyear meeting, Chase and Park Plaza hotels, St. Louis.

26-27 Western Petroleum Refiners Association, technical-industrial relations meeting, Settles Hotel, Big Spring, Tex.

26-27 American Institute of Mining and Metallurgical Engineers, Rocky Mountain Petroleum Sessions, Shirley-Savoy Hotel, Denver.

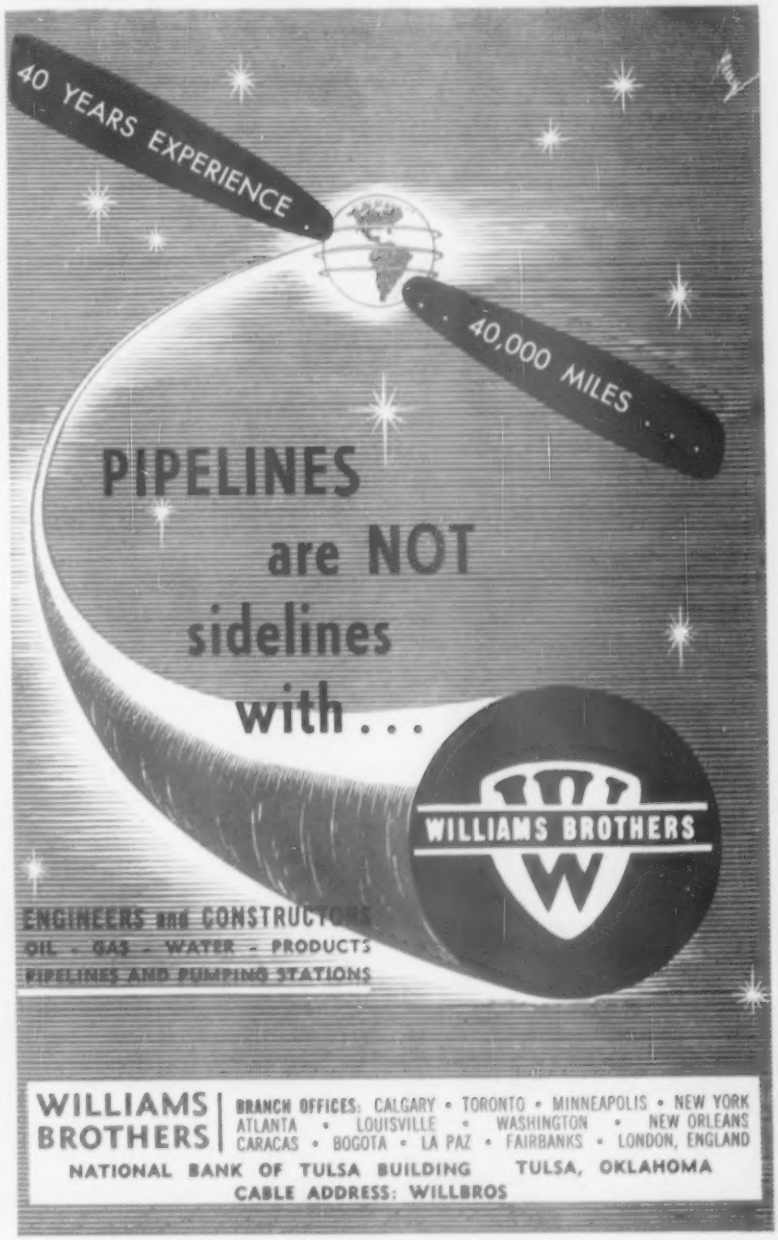
26-27 Kentucky Oil and Gas Association, annual meeting, Lafayette Hotel, Lexington.

30-June 1 Chemical Institute of Canada, thirty-eighth annual conference and exhibition, Quebec City, Que.

JUNE

1-3 Tenth annual Short Course on Gas Technology, Texas College of Arts and Industries, Kingsville, Tex.

5-9 Canadian Gas Association, annual


40 YEARS EXPERIENCE . . .
. . . 40,000 MILES . . .
PIPELINES are NOT sidelines with . . .
WILLIAMS BROTHERS
ENGINEERS and CONSTRUCTORS
OIL - GAS - WATER - PRODUCTS
PIPELINES AND PUMPING STATIONS
WILLIAMS BROTHERS
BRANCH OFFICES: CALGARY • TORONTO • MINNEAPOLIS • NEW YORK
ATLANTA • LOUISVILLE • WASHINGTON • NEW ORLEANS
CARACAS • BOGOTA • LA PAZ • FAIRBANKS • LONDON, ENGLAND
NATIONAL BANK OF TULSA BUILDING TULSA, OKLAHOMA
CABLE ADDRESS: WILLBROS

LONGER THREAD LIFE IN EVERY BUCKET!

MONEY BACK GUARANTEE

MONEY BACK GUARANTEE

Sold through your favorite supply store

Use JIMMIE GRAY Dope Brushes!

PETROLEUM DISTRIBUTING COMPANY

BOX 303 - HOUSTON, TEXAS - CHarter 3648

Quality Oil Field Lubricants Available in LA. - MISS. - TEX. - N.M. - N.D. - WYO.

meeting, Sheraton-Broeck Hotel, Niagara Falls, Ont.

6-9 Oil and Gas Power Division, American Society of Mechanical Engineers, 27th annual conference and engineering exhibit, Hotel Statler, Washington, D. C.

6-10 American Petroleum Institute, Division of Production, midyear committee conference, Brown Palace Hotel, Denver.

6-15 Fourth World Petroleum Congress, Rome, Italy.

7-9 National Oil Scouts and Landmen's Association, 32nd annual meeting, Banff Springs Hotel, Banff, Alberta, Canada.

9-10 Natural Gas and Petroleum Association of Canada, Royal Connaught Hotel, Hamilton, Ont.

9-10 Pennsylvania Grade Crude Oil Association, annual meeting, Hotel William Penn, Pittsburgh.

11-15 Petroleum Equipment Suppliers Association, annual meeting, Banff Springs Hotel, Banff, Alberta, Canada.

12-17 Society of Automotive Engineers, golden anniversary summer meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

16-18 Interstate Oil Compact Commission, Cosmopolitan Hotel, Denver.

17 Northern California Section, American Institute of Chemical Engineers, symposium on waste disposal, University of California, Berkeley, Calif.

20-23 American Society of Mechanical Engineers, semiannual meeting, Statler Hotel, Boston.

23-24 Western Petroleum Refiners Association, technical-industrial relations meeting, Broadview Hotel, Wichita, Kans.

23-26 Rocky Mountain Oil Show, Casper, Wyo.

26-July 1 American Society for Testing Materials, Chalfonte-Hadden Hall, Atlantic City, N. J.

JULY

20-22 Instituto Tecnologico y de Estudios Superiores de Monterrey, first annual short course on instrumentation for industry, campus, Monterrey, N. L., Mexico.

AUGUST

15-17 Society of Automotive Engineers, golden anniversary West Coast meeting, Hotel Multnomah, Portland, Ore.

29-31 15th annual Appalachian Gas Measurement Short Course, West Virginia University, Morgantown, W. Va.

SEPTEMBER

11-13 Independent Natural Gas Association of America, annual meeting, Jasper Park Lodge, Jasper Park, Jasper, Alberta, Canada.

12-14 American Institute of Electrical Engineers, electrical conference of the petroleum industry, Shamrock Hotel, Houston.

13-24 First International Instrument Congress and Exposition, and ninth National Instrument Conference and Exhibit, Philadelphia.

14-16 National Petroleum Association, 53rd annual meeting, Traymore Hotel, Atlantic City, N. J.

22-23 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Hotel Henning, Casper, Wyo.

22-23 Louisiana - Arkansas Division, Mid-Continent Oil and Gas Association, annual membership meeting, Roosevelt Hotel, New Orleans.

26-28 American Association of Oilwell Drilling Contractors, fifteenth annual meeting, Rice Hotel, Houston.

SAVE TIME, SAVE MONEY

Specify PRECISION

All your laboratory needs can be taken care of quickly, at lowest cost when you buy Precision equipment. Over 1500 items are available from Precision to meet your every requirement.

And you can be sure of long, dependable service from Precision equipment because *we make the items we sell.* Quality control in our factory plus Precision manufacturing efficiency assure you of top performance. Write us for descriptive bulletins.

IMMEDIATE DELIVERY ON THESE ITEMS:

Hi-Speed Centrifuge

Rheostat controlled speeds 1800-5000 rpm suitable for micro and semi-micro analysis, and difficult chemical separations. Holds eight 15 ml straight or tapered tubes. Adapters for ½ to 5 ml tubes. Data sheet 204.

Heaters and Hot Plates

Built specifically for lab service. High quality porcelain refractory tops. Provisions for apparatus set-ups on heaters. Two adjustable heat types: Ful-Kontrol with autotransformer control from 0 to 750 watts and Type RH with built-in rheostat. Catalog 600.

Mag-Mix Stirrers

Magnetically agitate liquids under pressure, in vacuum. Mix viscous liquids. Stir batches of test tubes simultaneously. Rheostat controlled speed ranges. Two electric models, one air model for safe use with flammable liquids. Bulletins 590-R and 595.

Micro-Set Thermo-Regulators

Control temperature within very narrow limits (models as sensitive as ±0.005°F). Operate electrical relay which controls heating elements, etc. Temperature setting may be pre-set or changed. Range spans as wide as —35° to +500°F. Bulletin 647A.

Precision Scientific Company

3753 West Cortland Street
Chicago 47

Eliminates 1 of 3 Tanks?

Yes! but--

PRECISION AUTOMATIC REID

Creates Even More Vital Savings

It is true that in the construction of new or the modernization of existing refineries the PRECISION AUTOMATIC REID Vapor Pressure apparatus can save up to hundreds of thousands of dollars — by eliminating the need for 1 OF EVERY 3 tanks now used in blending operations.

But of major interest to the petroleum industry are the facts that:

1. $60 per 10,000 barrels of finished gasoline can be saved through a gain of only 0.1 lb. in R.V.P.
2. The present average gain produced by Automatic Reid is over 0.2 lb.!

This thoroughly tested instrument—licensed by Standard Oil Company (Indiana) and manufactured exclusively by Precision Scientific Company—can make the following possible in your plant:

1. Maximum butane utilization.
2. Reduced ethylization costs.
3. Slashed blending requirements.
4. Safe, dependable in-line blending operation.

Accurate Reading — 3 Minutes

The meaningful potentials of the Automatic Reid are based on its ability to monitor as you blend and to give **an accurate reading of minor R.V.P. changes in only 3 minutes**—as compared with the less dependable readings given by the manual ASTM D 323 method **after a 4-hour stirring period!** Any change to higher or lower Reid material is noted during the blending operation IN TIME TO CORRECT THE BLEND. Trimming operations are easily accomplished.

Economy — Insurance — Better Product

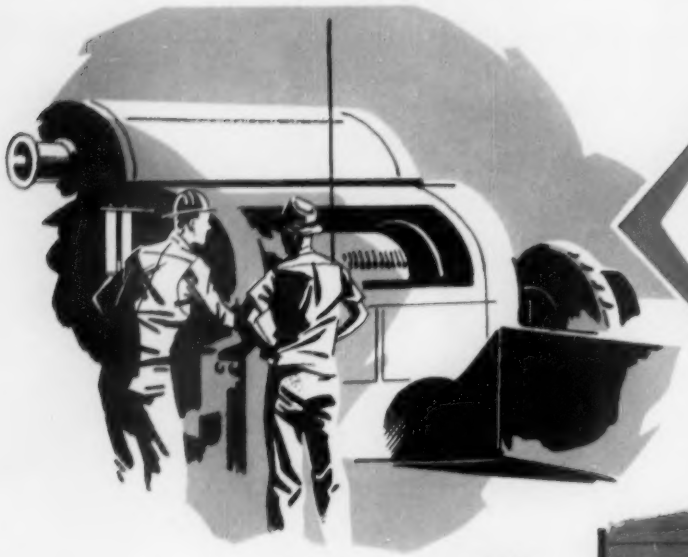
The Automatic Reid is practical for in-line blending. It gives a surety to batch blending—avoids the costly handling of product holdovers. Best of all, a better finished gasoline is produced while great savings are being made.

Send for your copy of the 8-page catalog, detailing advantages, operation, features, principles of operation, design, construction and installation.

AVAILABLE FOR IMMEDIATE DELIVERY

Precision Scientific Company

3753 West Cortland Street • Chicago 47, Illinois



You can

Talk

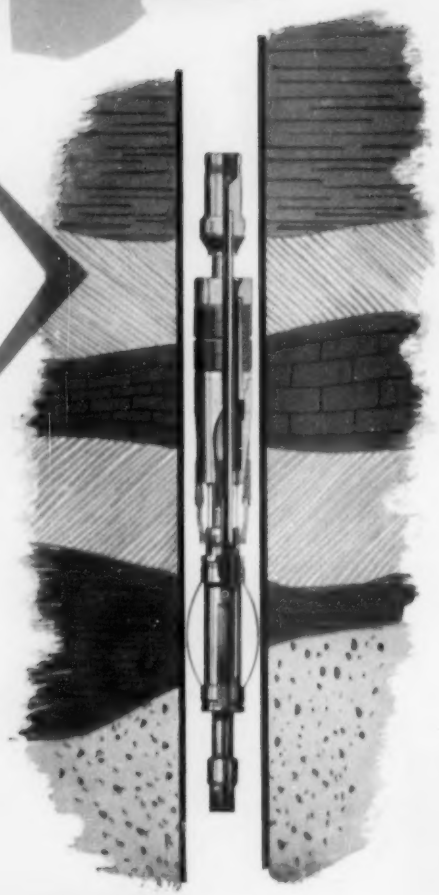
about performance here!

Words won't make a packer—but you can learn a lot about the bottom hole performance of Lane-Wells Packers by talking to the many operators who use them. Things like leakproof pack-off, positive setting, easy pulling, for example. There are reasons, of course; the controlled expansion of the packing element, whose special material doesn't "vulcanize" to the casing but springs back ready for resetting; the generous by-pass area of the circulation packers, which allows fast running in fluid and easy equalization of pressures before pulling; the valve seal which operates even with junk on the seat; the 'Slydeze' slips which don't 'freeze' to the cone; the lifting lugs which reduce compression of the packing element to eliminate sticking; the 'free-wheeling' cage—and the fact that among the 314 types and sizes of Lane-Wells Packers there's at least one which is tailor-made to do *your* job!

Lane-Wells Packers

Deliver

performance here!



Write for details about

LANE WELLS COMPANY

PACKER SERVICE

Tomorrow's Tools - Today!

AP-710

General Offices, Export Office and Plant • 5610 So. Soto St. • Los Angeles 58, California

Los Angeles • Houston • Oklahoma City • Lane-Wells Canadian Co. in Canada • Petro-Tech Service Co. in Venezuela

The OIL AND GAS JOURNAL

TULSA, OKLAHOMA

Published every Monday by The Petroleum Publishing Co., 211 South Cheyenne Avenue, Tulsa, Okla. Phone 3-6291. Founded in 1902. Name changed to The Oil and Gas Journal in 1910 by Patrick C. Boyle.

•

P. C. LAUINGER
President

S. H. ROURKE
Executive Vice President

MITCHELL TUCKER
Vice President and Advertising Manager

HANSON B. PIGMAN
Circulation Manager

DONALD W. WILSON
Manager Industry Census Department

J. PARKER HOLLAND
Production Manager

ADVERTISING OFFICES

TULSA
211 South Cheyenne, 3-6291
JOHN D. REILLY . . . Mid-Continent Manager
HARRY B. BULLEN . . . . . Representative

NEW YORK
500 Fifth Avenue, LOngacre 4-6160
CHARLES A. WARDLEY . . . Eastern Manager
JAMES W. BROWNLEE . . . Representative
JOHN W. MEANY, JR. . . . Representative

CHICAGO
105 West Madison Street, CEntral 6-2537
E. S. KLAPPENBACH . . . Midwestern Manager
DAVID T. KENNEY . . . . . Representative
JOHN D. YODER . . . . . Representative

PITTSBURGH
106 Nelson Avenue, FRemont 1-7775
ALFRED M. JONES . . . . . Manager

HOUSTON
Sterling Building, CHarter 4626
JOHN M. SPEARS . . . Gulf Coast Manager

DALLAS
1238 Mercantile Bank Building, STerling 3074
GEORGE O. RUPPERT . . . . . Representative

LOS ANGELES
650 South Grand Avenue, VAndike 0772
DONALD O. HANSON . . . . . Manager

ENGLAND
National Provincial Bank Chambers,
15 Grafton Street, Altrincham
Phone Altrincham 3160
HARRY BECKER . . . European Representative

•

Subscription rates to the petroleum industry, United States and foreign, 1 year, $4.00; 2 years, $7.00, 3 years, $8.00. Single copies: regular issues 50 cents; special issues $1.00. Back copies when over a year old, $1.00. Note: Payments from outside the U.S.A. may be made by international money order, New York Exchange, or check on a U.S.A. bank. Entered as second-class mail matter at Tulsa, Okla., under Act of March 3, 1879. Copyright 1955 by The Petroleum Publishing Co.

Member
Audit Bureau of Circulations
Associated Business Papers

JOURNALLY SPEAKING . . .

The Roman Way

A BIG World Petroleum Congress is going to be held in Rome in a couple of weeks, and we are intrigued with some of the advance preparations.

Naturally a meeting of this size, with so many speakers from many countries, must adhere rather closely to its schedule. But the local arrangements committee (probably known as a secretariat in European protocol) is not taking any chances that long-winded speakers will run over their allotted time. By combining ancient Roman efficiency with modern electronic science the planners have developed a method of telling the speakers "Shut up!" in seven languages.

Witness this verbatim quote from "Instructions to Chairmen" as printed in the advance program:

"As soon as the lecturer has begun to speak, set the stop watch in operation. This stop watch runs for a maximum of 20 minutes. For the first 10 minutes the watch gives no signal; at the beginning of the eleventh minute a green light appears on the lecturer's platform with the words 'another 5 minutes'; at the beginning of the thirteenth minute the green light goes out and a yellow light appears with the words 'another 2 minutes'; at the end of the fifteenth minute the yellow light goes out and a red light flashes the signal 'stop'; at the same time a series of low buzzes can be heard. Simultaneously with these signals, corresponding lights in green, yellow, and red appear on the panel on the secretary's desk.

"At the last signal the lecturer must interrupt his lecture. The red light and the buzzing last for about 2 minutes. If the lecturer continues, and unless the chairman has decreed otherwise, the secretary shall disconnect the lecturer's microphones and request the lecturer through his own microphone to comply with the necessary ruling, inviting him to have a seat in the chair beside the platform."

About the only thing that could be added would be a trap door in the platform, sprung by another button on the secretary's control panel, through which a speaker could be made to disappear if he ignored the invitation to take a seat.

Since this country once fought a war with England to gain the right of free speech, and since we more recently fought a world war in defense of the Four Freedoms (one of which, we seem to recall, was Freedom of Speech), we can't officially endorse this system for adoption in these United States. Besides, it has a sort of a Fascist tinge. But, confidentially, we have attended some meetings where we secretly wished that some such arrangement was functioning — particularly a trap door.

Sunshine Threat

AS if the oil and gas industry didn't have enough to worry about, what with excess producing capacity, low allowables, high imports, and federal control, along comes another threat to its markets.

We're not talking about atomic energy. That's old stuff by now. This is something new. Solar energy.

We have just heard that there is such a thing as the Association for Applied Solar Energy, and that it is sponsoring the first World Symposium on Applied Solar Energy, to meet in Phoenix and Tucson, Ariz., next November.

The announcement says that the A.A.S.E. is providing a common point of departure for the much greater effort which must be undertaken in the field of solar-energy research "in view of increasing demands being put on diminishing sources of conventional fuels."

That line about "diminishing sources of conventional fuels" sounds like another way of saying "we're running out of oil," and likely would raise an argument from any Texas producer on a 16-day allowable.

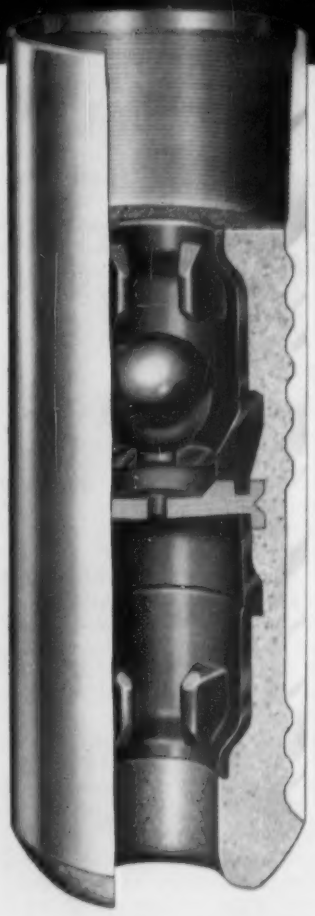
However, a mitigating circumstance is that the A.A.S.E.'s headquarters is in Arizona, a state which has no oil, coal, or gas, and whose principal natural resource is sunshine—a commodity which certainly could have better utilization than it gets in many parts of that state.

If solar energy is going to be the thing of the future, maybe oil men ought to get in on it. At least they wouldn't be bothered by competition from imports. But on the other hand, we can't figure out how they would get their 27½ per cent depletion allowance on sunshine.

—*Henry D. Ralph.*

AUTOMATIC, REGULATED *FILL OF THE CASING AS IT IS BEING RUN*

***PROTECTION AGAINST DESTRUCTIVE HIGH-PRESSURE SURGES**



with

BAKER FLEXIFLOW

FILL-UP SHOES AND COLLARS

Baker Flexiflow Fill-Up Equipment, a new companion line to Baker Differential Fill-Up Equipment is designed to be run in wells of moderate depth.

FEATURES

SELF-ADJUSTING FLOW CONTROL DIAPHRAGM

Baker Flexiflow Fill-Up Equipment contains a variable valve (Self-Adjusting Flow Control Diaphragm) that automatically opens wider or closes down to provide MINIMUM BOTTOM-HOLE PRESSURE INCREASES and regulated fill of the casing.

POSITIVE BALL-TYPE BACK-PRESSURE VALVE FOR CEMENTING

A Ball-Type, Back-Pressure Valve for floating or cementing can be brought into action at any time by applying a pressure of approximately 700 psi to the casing. See Figs. 2 and 3 below.

COMPLETELY DRILLABLE

The internal parts of Flexiflow Fill-Up Shoes and Collars consist of readily drillable concrete, a small amount of Bakelite and synthetic rubber.

ECONOMICAL

Baker Flexiflow Fill-Up Equipment not only permits the casing to be run more rapidly with greatly reduced pressure increases or surges on the formations below the shoe, but in addition, by eliminating the surface-filling operation, saves an additional amount of rig time. When these advantages are considered, Flexiflow Equipment is much more economical to run than conventional floating equipment.

***Pressure surges over 5,000 psi can be created each time a joint of casing equipped with conventional floating equipment is lowered under certain slim hole clearances.**

High-Pressure surges can fracture and weaken a formation sufficiently to cause lost circulation or the failure of a primary cement job.

These destructive, high-pressure surges can be reduced . . .

- **by increasing the lowering time per joint**
- **by increasing the casing clearance**

or

- **by running Baker Flexiflow (or Differential) Fill-Up Shoes and Collars**

NOTE:

Baker Fill-Up Equipment contains a variable valve that automatically opens up and adjusts to maintain minimum bottom-hole pressure as the casing is being run.

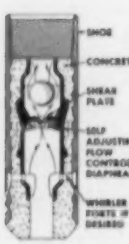


FIG. 1 Casing Filling while going in the hole

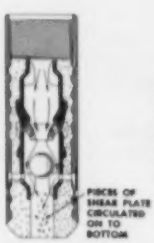


FIG. 2 Ball pumped through diaphragm

FIG. 3 Ball shut-off against cement back-pressure

BAKER
OIL TOOLS, INC.
HOUSTON · LOS ANGELES · NEW YORK

EDITORIAL

Why is oil so cheap?

GONE are the $500 car, the 5-cent cigar, the dollar watch . . . but gasoline (without taxes) costs only slightly more than it did back in 1925. This is the direct result of competition.

That's the theme of a recent magazine advertisement of the American Petroleum Institute. Nobody can quarrel with that. And yet . . . competition doesn't seem to be the whole explanation.

Competition there certainly is in the oil business, and competition has done much to make gasoline the biggest bargain on today's shopping list. But there is plenty of competition in the automobile, tobacco, and watch industries.

SO WHY IS GASOLINE SO CHEAP? Let's look at some of the other factors that keep consumer prices low:

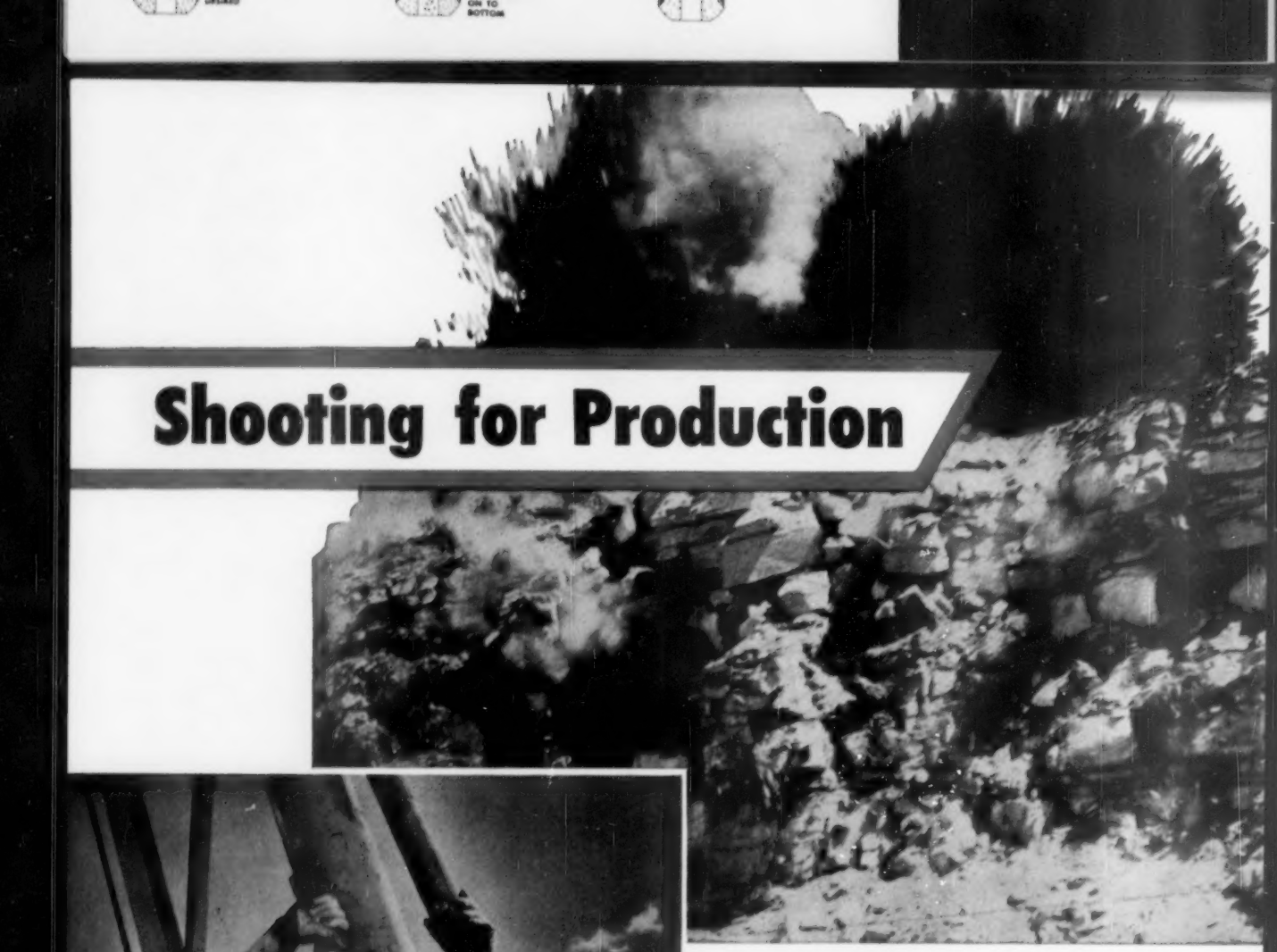
- Technological advances—Oil is a leader in developing and applying new processes, but most American industries are not markedly laggard in this respect.
- Mass production—Autos and watches are usually considered the leaders in this, though it is equally true of oil.
- Volume distribution—Oil's growth in per capita consumption and universal availability is not enough greater than other commodities to account for the difference in price increases.
- Manpower utilization—All industries have increased their output per man-hour, and oil is not spectacularly ahead of many others.
- Small profit margins—True of oil, but also of most competitve industries.
- Ample raw materials—There's always been plenty of crude oil, but the nation has seldom been short of many essential commodities.
- Cheap transportation—Here, perhaps alone of all the factors, oil has an edge. But the efficiency of pipelines and tankers can't be the whole explanation.

IS IT A COMBINATION of all these factors which has held gasoline prices to close to the 1925 level while most other prices have gone way up?

Probably so, and the industry can be thankful that it has had the advantage of all of them. And the nation can be thankful that competition in the oil business has made all the factors function for the benefit of consumers.

Or does oil have some other, special, peculiar circumstance that keeps the prices of its products from rising as fast as those of most other industries? It's an interesting philosophical question, but perhaps an idle one.

The really important thing is to maintain the aggressive competition that forces the industry to use everything that keeps gasoline the biggest bargain on the shopping list.



Shooting for Production

● A perforating gun entering the casing — familiar sight in the Oil Fields — is a reminder that, when you shoot for production, the properties and performance of the cement behind that casing are of key importance.

Lone Star shoots for production, too—for oil-field production — by engineering into its Oil Well Cements the properties required to assure strong, dense, long-lasting shut-offs under any given set of conditions.

Even before the quarry blast, raw materials are carefully prospected. Knowing their composition, the laboratory checks and adjusts all raw materials —and checks the finished product as well—to assure the required properties for each type of cement.

Let well conditions decide which cement to use . . . let trouble-free performance confirm your choice.

LONE STAR CEMENT CORPORATION

Offices: DALLAS • HOUSTON • ABILENE, TEX.
NEW ORLEANS • BIRMINGHAM • KANSAS CITY, MO.
ALBANY, N. Y. • BETHLEHEM, PA. • BOSTON
CHICAGO • INDIANAPOLIS • NEW YORK
NORFOLK • RICHMOND • WASHINGTON, D. C.

Select Cement to Fit the Job!

THIS WEEK . . . . . IN THE NEWS

Pipelines

• Coming before the Federal Power Commission this week will be an El Paso Natural Gas Co. request to expand its huge system to California. El Paso Natural wants to build a 34-in., 500-mi. looping line from the San Juan basin to the Arizona-California border. Aim is to deliver 450,000,000 cu. ft. more gas a day to California customers. Half of this new gas will be sold El Paso Natural by Pacific Northwest Pipe Line Co., which last week let first contracts on its trunk line from Washington to the San Juan.

• Pipeliners attending the A.P.I. conference in Chicago have taken some stern advice: Stockpile emergency repair equipment and train crews to shore up wartime damage from enemy attack or sabotage. They were told pipelines are vulnerable to sabotage and pump stations to air or artillery attack.

• A slower pumping rate in transferring jet fuel to tanks has proved the answer to the ticklish danger of explosion. High-rate pumping often causes static electricity which arcs the liquid and ignites the tank vapors.

• Lone Star Gas Co. has until July 1 to furnish the FPC with data on its gas reserves. The information must be supplied to support the firm's request to build two pipelines to service Natural Gas Pipeline Co. of America.

Exploration

• Another big Ellenburger structure may have been uncovered by a Humble well 10 miles north of Odessa. The test, Humble 1 Barrow, is 2 miles west of the Ratliff-Ellenburger field, a 1954 discovery. The Humble well topped the Ellenburger only a foot from the 10,553 ft. sample-top on the earlier discovery. The new well flowed 69.85 bbl. of 52°-gravity oil in 1½ hours from 13,576-98.

International

• Sicily is gaining prominence as an oil producer. The fourth well has been completed in the new Ragusa field there, and oil has been found in a fifth test. Meanwhile, development of the Cigno field on the Italian mainland is being held up pending the government's decision on exploitation rights. Action is expected soon on company applications.

• Austria regains control of oil fields captured during World War II, but Russia will retain an interest in Austrian production. Terms of Austrian-Russian treaty provide for delivery of about 70,000,000 bbl. of crude to Russia in the next 10 years.

• Puerto Rico's first oil refinery has gone on stream, and a second one is due to be completed late this year. At least two petrochemical plants also are in the talking stage.

Drilling

• The "Super Jet," a new small-diameter perforating gun, promises to change well-completion techniques in some localities. The perforator is small enough to fit into 2 or 2½-in. tubing. Since charges are small, they can be placed horizontally in the gun. Thus, they increase penetration.

• Tidelands drilling methods are coming in handy in Canada's muskeg country. Texaco Exploration Co. is drilling directionally from an island platform. A sea of mud surrounds the drilling rig.

Natural Gas

• Look for the Harris bill to provide some measure of price control over gas prices at the wellhead. The House interstate commerce committee has written an amendment to the bill. It allows the FPC to pass on price increases arising from most types of escalation clauses in producer-pipeline contracts. The bill originally intended to exempt producers from price controls.

• California oil men and refiners are complaining about the stepped-up flow of out-of-state natural gas into their own backyard. They say it is undercutting markets for their heavy crude and residual fuels. They want gas companies to put the additional gas into underground storage instead of selling it at cheaper rates to industrial users. Out-of-state gas is currently flowing into California at the rate of nearly 1.5 billion cubic feet daily, and this will jump to 1,850,000 M.c.f. by 1959.

Offshore

• Louisiana and the federal Government clash again over offshore oil rights following a record-breaking state lease sale. Humble offered Louisiana $7,660,111 for a 4,687-acre lease near the mouth of the Mississippi River, by far the largest sum ever bid on either a state or federal lease in the tidelands. Here's the rub: Interior Secretary Douglas McKay says part of the land offered by the state is within the area claimed by both the U. S. and Louisiana. A showdown may come in July when the federal Government offers leases on more tracts in the disputed area.

Better Times Ahead for L.P.G.?

- Last winter was a low point in the industry's economic history
- Storage, plus 1954-55 lessons, should stabilize a normally shaky market

John C. Casper and Joe Reilly

TULSA.—Producers of liquefied petroleum gas have just pulled through the greatest crisis in the rather turbulent history of their industry. The question now is whether they can prevent a relapse next winter.

The L.P.G. market collapsed 2 months ago. Huge supplies of butane and propane were dumped on the market late in the winter. Prices fell to the lowest point since L.P.G. became a major factor in the oil industry's economy. Tank-car prices dropped 2 cents a gallon, just half what they were during the preceding winter.

The market is still shaky, but signs indicate better days may lie ahead. Here are some of the hopeful symptoms:

. . . **Prices have eased upward** about 0.5 cent per gallon, reversing the cycle which normally brings lower prices in warm weather.

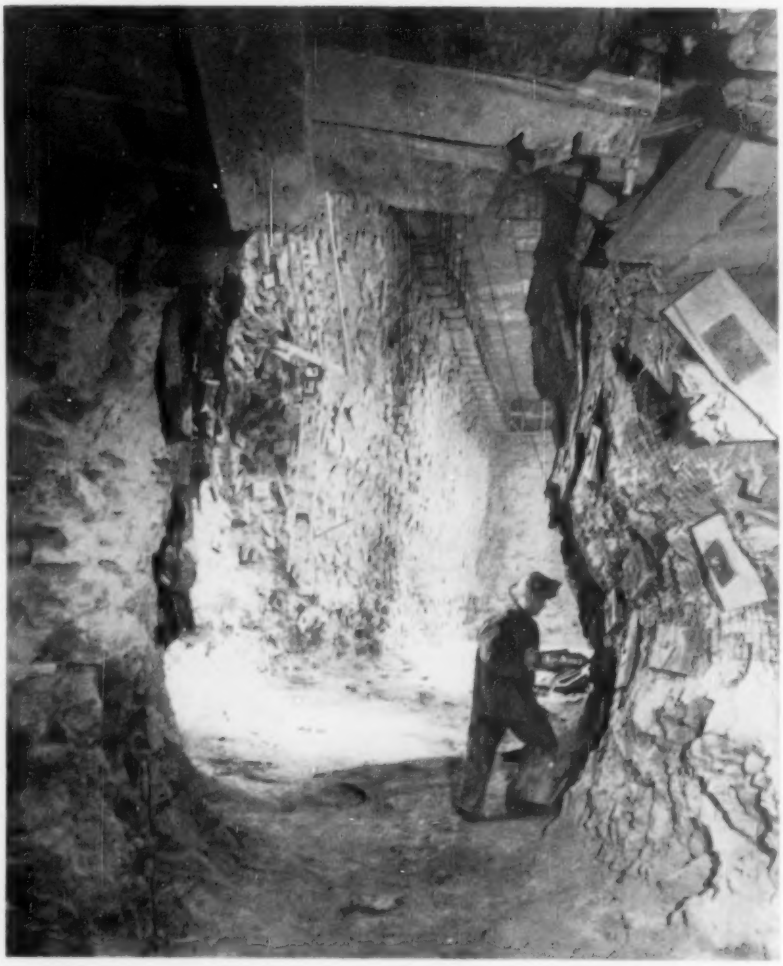
. . . **The industry has learned** that the recent panic was largely its own fault. Many producers now believe unwise dumping of surplus stocks caused the market to hit bottom.

. . . **Future growth** of the industry may be even greater than has been forecast. Some producers are counting on the petrochemical industry to provide important new outlets for surplus L.P.G.

The recent price increase and other favorable signs have made the once-dreary outlook a shade or two brighter. Forecasts are shrouded in caution, but they give the industry something to hope for other than a cold, cold winter.

Perhaps the most depressing factor in the industry last winter was underground storage, the very thing which had been expected to bring year-round prosperity.

At the end of February, suppliers had 117,000,000 gal. of L.P.G. in underground storage. A year earlier, the total was estimated at only 75,000,000 gal.



UNDERGROUND STORAGE promises to be a big factor in stabilizing the L.P.G. market. Typical of the subsurface storage facilities in this cavern near Kankakee, Ill., now in use by Phillips Petroleum Co. The cavern, mined in shale, is used for storage of propane during the summer. It has a capacity of about 255,000 bbl.

The problem . . . Much of last winter's trouble was caused by L.P.G. suppliers who were trying to make a killing on products stored in caverns. They had huge investments in storage facilities, and many thought they could pay for them in a couple of years.

Though last winter's average temperature was near normal, cold weather was late in coming. Some suppliers got nervous and started unloading surplus supplies. They had to make room for new production, which far exceeds demand in warm weather.

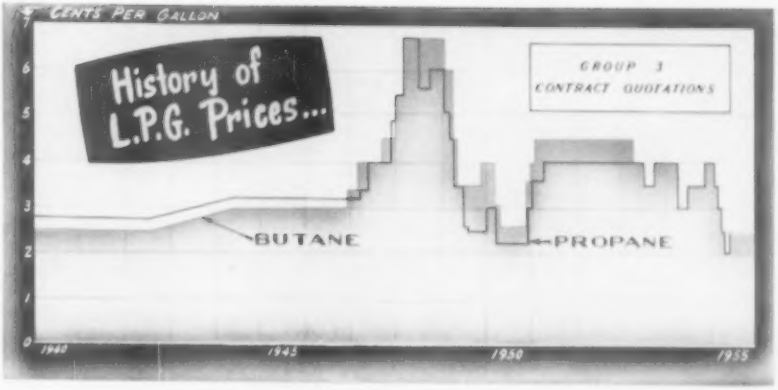
This caused the price structure to crumble. Because of the oversupply, tank-car prices in the Mid-Continent area fell from 4 cents a gallon in November to 3 cents in February. Panicky selling forced the contract price down to about 2½ cents early in March and to 2 cents by the end of the month.

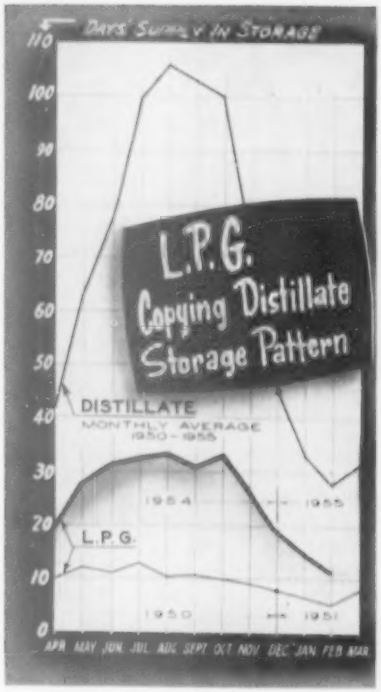
The spot-market price went still lower. "A lot of people sold at 1 cent this year to get rid of it," recalls one industry leader.

Another factor contributing to the soft market was the entry of a few new suppliers. They further upset the supply-demand relationship when the market was already wavering.

Has storage paid off? . . . Until this year, L.P.G. commanded a high price each winter because it was scarce. As the weather warmed, demand dropped and prices went down with it.

Underground storage seemed the logical answer. Producers could store part of the low-demand output in the summer and hold it for winter prices. Since they wouldn't flood the market during





the summer, they reasoned, underground storage should bolster the market throughout the year.

But, in many cases, underground storage had a reverse effect. Since the L.P.G. scarcity was eased in cold weather, the market levelled off at a point well below the normal peak. Any gain from stabilized summer prices was lost when the extra stocks underground at the end of the year scared suppliers into undermining the winter market.

Although underground storage has not always brought quick profits, most suppliers believe it is proving a success. It has given the industry a degree of stability, enabling producers to meet the demand when consumption is highest. Underground storage has helped the industry mature. Suppliers are convinced that wiser use of winter reserves will help prevent a future market collapse. What is needed, they feel, is more storage rather than less.

L.P.G. suppliers now are being more realistic about the potential of underground storage. They don't expect to double their money on every gallon withdrawn from reserves. Whatever price they get for the product above costs of production, freight, and storage is pure profit. As one veteran producer points out, "if it wasn't for the underground storage, they'd burn it."

The answer . . . Underground storage will not cure all the industry's ailments, but if properly used it can help steady an otherwise shaky market. Many men in the industry think underground storage is just now beginning to prove its worth.

Caverns in use, however, provide space for a relatively small amount of L.P.G. Underground capacity in the United States totals only a little more than 11,000,000 bbl. The most material in underground storage at any time was the 6,700,000 bbl. on hand at the start of last heating season.

If all caverns were filled, the total would supply a peak-demand market for only about 23 days. Total L.P.G. in underground storage at the end of February represented less than 6 days' supply.

The L.P.G. industry may profit from the more-experienced marketers of light heating oils. Suppliers of middle distillates have learned to expect great fluctuations between winter and summer demand, and they are prepared for seasonal changes. By development of off-season marketing incentives, they have learned to spread sales through warm weather and thereby increase storage available for high-demand periods.

For example, before announcing the summer-fill programs for this year, marketers on the East Coast cut the price 0.15 cent a gallon on kerosine and No. 2 fuel oil. In addition, they gave a voluntary allowance of 0.5 cent a gallon on summer purchases, bringing the total off-season price reduction to 0.65 cent per gallon. The cut in each case amounts to slightly more than 6 per cent.

The summer-fill programs also provide other incentives to boost off-season sales. One of these is the deferred-payment plan which allows customers in good standing to wait until early fall to pay for summer purchases. Such practices have made the market more stable. In effect, they allow a supplier to store part of the summer surplus in tanks owned by distributors and consumers.

In the past, the high cost of pressurized steel tanks made it uneconomical to store much L.P.G. through the summer. But with low-cost underground storage, suppliers are able to hold bigger quantities of cheap fuel for winter markets.

Supply-demand shifts . . . A study of the relationship between stocks and demand shows that the L.P.G. supplier is beginning to accept the seasonal shifts that for years have been normal in distillate marketing.

In the accompanying chart, this relationship between stocks and demand is shown by expressing inventories by months in terms of days' supply. Note that the curve for L.P.G. was very flat in 1950 and 1951, but that there was a much sharper climb during the summer months last year.

Total inventories of L.P.G., including stocks at plants, refineries, terminals, and underground facilities, reached 10,271,000 bbl. at the end of October last year. Total represented 33.4 days' supply, based on demand in October.

Note the sharp downward slope of the curve, starting with November, that brought inventories down to 11.8 days' supply by the end of February. Peak inventories, measured in days' supply, were 2.8 times the low point at the end of February.

Distillate inventories, on a similar basis, reached a maximum at the end of August when the stocks were 106 times daily average demand. This total, in terms of days' supply, was 3.8 times the supply at the end of the following February.

Stability is important . . . The producer, distributor, and consumer would all profit from stability in the industry.

For the producer, it would mean shifting from a feast and famine economy to one with a reasonable balance between supply and demand. The summer surplus would go either to his own storage or to a marketer's storage at a reasonable summer price. In the past, summer surplus above contract

demands was almost a complete loss. Some was dumped into the natural-gas stream. Some was sold, in very small amounts and at very low prices, to anyone with a summer market. A large amount was vented or flared.

The distributor will be in a better position to serve his customers if he can depend on a stable market. In the past, he was never sure he would have enough fuel to supply his customers through the winter. One severe shortage would cause his customers and potential customers to look for another fuel. Because of continuing changes in contract prices, the distributor had to make frequent adjustments in prices to consumers.

L.P.G. Defies Atomic Blast

LAS VEGAS, Nev.—The potential role of L.P.G. in modern warfare was demonstrated in one of the recent atomic tests near here.

A dozen L.P.G. installations withstood the atomic blast at close range, and shortly after the test an estimated 800 spectators ate a hot breakfast cooked with liquefied gas. Use of L.P.G. as an emergency fuel was demonstrated by the Liquefied Petroleum Gas Association in cooperation with the Federal Civil Defense Administration.

The test proved that L.P.G. units as close as ¼ mile from ground zero were serviceable after the atomic blast. A bulk installation 4,700 ft. from the impact center suffered only minor damage.

Engineers said there was no gas loss nor fire at any of the L.P.G. units in the test area.

A stable industry would assure the consumer a constant supply of fuel at a price he's willing to pay.

Need for current data . . . Another factor which may help shape the future of the industry is statistical reporting.

Many top men in the industry complain that supply-demand figures are always 2 months old. If suppliers had been well informed of the market trend last winter, the price of L.P.G. likely would have been much steadier.

The story is told of one major marketing company which dropped its price in February, apparently because it figured demand was slipping. The price reduction was ordered without prior notice, so it had little or no effect on immediate sales. According to one report, the company's L.P.G. shipments reached their highest peak in history the very day the price cut went into effect.

Figures recently released by the Bureau of Mines show that L.P.G. demand in January and February was 20.8 per cent higher than in the same months of 1954. Production for the same period was up about 11.4 per cent. These figures came as surprise to many in the industry.

Outlook . . . The L.P.G. industry is expected to continue its rapid growth, perhaps at a faster pace than in the past.

Sales in 1954 were up more than 4 per cent. The gain would have amounted to about 10 per cent, though, if the amount of L.P.G. going into synthetic rubber and manufactured gas had not fallen off. Sale of the Government's rubber plants to private companies should increase demand in that industry this year.

Healthy sales increases are forecast for L.P.G. used as motor fuel, in home heating, and chemical manufacture. A recent study by the Liquefied Petroleum Gas Association showed an increase of 42 per cent last year in the number of trucks, buses, stationary engines, and lift trucks burning L.P.G. At the end of the year, approximately 92,000 such units were fueled by L.P.G.

Efforts of several big companies to expand their L.P.G. purchases in Texas have spread rumors that butane and propane soon may become more widely used in manufacture of chemicals.

Producers are counting on a gradual rise in L.P.G. prices during the next few months, perhaps to about the level they were at the start of last winter. Such a shift in the normal price trend would be a good indication that underground storage is beginning to pay off. It also would show that the industry is nearing maturity.

Refining Briefs

ALMA, Mich.—Leonard Refineries, Inc., will build a 3,600-bbl. per day Ultraforming unit and a 4,200-bbl. per day Hydrofiner at the company's refinery here. Crude capacity is also being expanded from 10,500 to 14,000 bbl. per day. Leonard is also installing a sulfur-recovery unit which will convert hydrogen sulfide to about 10 tons per day of elemental sulfur. The new catalytic reformer will be licensed by Standard Oil Co. (Ind.), and the hydrogen-treating unit by Esso Research & Engineering Co. Leonard is the first company not affiliated with Jersey Standard to license a Hydrofiner.

YORKTOWN, Va. — American Oil Co. has contracted with Lummus Co. for a delayed-coking unit for the 35,000-bbl. per day refinery it is building near here. Design details of the coker are being completed. Work on the refinery's first process units will be started this summer. The schedule calls for first operations to begin late in 1956. Amoco will sell the coke from the new unit to Virginia Electric & Power Co., which is building a power station next door.

CARSON CITY, Mich.—Harry Litwin, Wichita, and Edward Fleischman, Detroit, have purchased Crystal Refining Co. of Carson City, Inc. The new owners plan to modernize a 6,200-bbl. topping plant located here. Litwin is vice president and director of Century Refining Co., Garden City, Kans. Fleischman is president of Lakeside Refining Co., Kalamazoo, Mich., and an officer of Petroleum Specialties, Inc., of Flat Rock, Mich.

NEW YORK.—The Texas Co. has placed two more combination Platforming-Unifining units on stream at its refineries. The largest is a 20,000-bbl. unit at the Port Arthur, Tex., refinery. Its design is similar to one that went on stream at the refinery there last summer. The second is a 13,000-bbl. unit at the Lawrenceville, Ill., refinery. Both units were built by the Lummus Co. and licensed by Universal Oil Products Co.

CLEVELAND.—Standard Oil Co. of Ohio has awarded a $2 million contract to Fluor Corp., Los Angeles, for engineering work and equipment on an 11,000-bbl. Ultraformer planned at its Refinery here. It is the second catalytic reforming unit added at Sohio's refineries. A Platformer is in operation at the Lima plant.

NEW YORK. — The Texas Co. is adding two major buildings at its Beacon, N. Y., research center, its largest, and a third at its Port Arthur, Tex., refinery. A four-story analytical and testing building at Beacon will house 51 laboratories and offices, plus other facilities. A new three-story wing also is being added to its administration building. At Port Arthur a new analytical and testing building will centralize all quality-control work in the refinery. It will include 31 laboratories.

Texas Tax Cut Seen

Senate subcommittee gives house-approved bill working over, recommends that other businesses share burden

AUSTIN, Tex.—The Texas oil and gas industry may get some relief at long last from a heavy tax responsibility—if a Texas Senate subcommittee's recommendations on new taxes are followed by the legislature.

The industry in Texas pays an overwhelming share of the state's business taxes—about 70 per cent. The legislature prior to the subcommittee action, had shown no inclination to distribute the tax burden more evenly. Even in the current session, many legislators took the easy way and proposed additional increases in oil and gas taxes to meet new revenue needs.

The subcommittee in a surprise move last week gave a house-approved tax bill continuing this trend a good working over.

One tax dropped . . . The house bill provided for most of its new revenue from a 1-cent increase in the state gasoline sales tax and by cancelling a scheduled 1 per cent drop in the natural gas production tax.

The gas tax was increased from 5.72 per cent to a flat 9 per cent without industry opposition in a special session of the legislature a year ago when emergency measures became necessary to boost teachers' salaries.

The legislature provided that the tax rate would fall to 8 per cent this September and to 7 per cent in September 1956, theorizing that increased gas production would keep the state revenue from this source about the same in spite of the tax cuts. The industry charged the legislature broke faith when the house recently fixed the gas-tax rate permanently at 8 per cent.

The senate subcommittee recommended the natural-gas tax provision be dropped from the bill and that the state's tax base be broadened by levying gross receipts taxes on department stores, hotels, and on the manufacturing of liquids by chemical, metallurgical, or electrolytic processes.

Chemicals hit . . . The new tax would of course affect the petrochemical industry. This tax provides for a levy of 2 per cent of gross receipts in excess of $10,000 a quarter.

The subcommittee's recommendations, however, will have to travel a long hard road before they become law if they do.

They first must be adopted by the senate state affairs committee itself, which was expected to vote on the revised bill late last week. Then comes the senate vote and then approval by members of a joint senate-house committee.

They base the argument on subcommittee provisions that the gross receipts tax apply only to chemical manufacturers realizing more than $10,000 a quarter, department stores earning more than $250,000 a quarter, and hotels and motels earning more than $5,000 a quarter.

Oil-tax hike rejected . . . The subcommittee refused to go along with an amendment proposed to the full committee during hearings on the bill which would have equalized oil and gas production taxes at 6 per cent of value at the wellhead.

This would mean raising the severance tax on crude oil from the present 4.6 per cent and lowering the current 9 per cent tax rate for natural gas.

The amendment would have increased revenue to the state substantially since taxes on crude production are a good deal more lucrative. The 4.6 per cent rate on oil brought in almost $12,000,000 in April, while the 9 per cent gas tax for the same month totaled a little over $3,000,000.

Another amendment rejected by the subcommittee would have taxed gas reserves dedicated to pipelines under long-term contracts. The tax, one-twentieth of 1 cent per M.c.f., would have been paid by the pipelines or "beneficial owners" of the gas. It would have applied to both dry and casinghead gas.

Pipeline attorneys advised the committee against accepting this amendment, saying its main effect would be to create business for attorneys in getting it knocked out.

These or other oil or gas taxes could still be added before a law is passed. And trying to predict what the legislature eventually may come up with in the way of new taxes to provide an estimated $116,000,000 needed for new expenditures is a hazardous business.

Well Extends Trend

Humble has important West Texas discovery

ODESSA, Tex.—Humble Oil & Refining Co. has added a significant Ellenburger producer to the northwestern end of the Ellenburger Trend fields of Midland and Ector counties in West Texas.

The well is the Humble 1 Barrow, 10 miles north of Odessa and 2 miles west of Ratliff - Ellenburger field, a 1954 discovery. The 1 Ratliff had about 42 ft. of Ellenburger pay and completed for 580 bbl. of oil.

The Ratliff-Barrow discoveries have uncovered a new structure of sizable proportions. The No. 1 Ratliff topped the Ellenburger at minus 10,553 ft. Sample-top on No. 1 Barrow places the Ellenburger at minus 10,554 ft.

The 1 Barrow flowed 69.85 bbl. of 52°-gravity oil in 1½ hours on its first test of the Ellenburger at 13,576-98 ft. Total recovery, with no water, was 157.77 bbl. of oil. Operators then cored ahead to 13,618 ft., which was dolomite with fair to excellent porosity. This well also had oil recoveries from the Wolfcamp and the Devonian sections.

Other successes . . . Humble's deep exploration this year has developed five strikes out of five trys, including 1 Barrow. Others have been: No. 1-D Rosa Barnett, a 1,615-bbl. Ellenburger discovery west of Amacker - Tippett field, Upton County; No. 1-B York, a 452-bbl. Ellenburger well 6 miles southeast of Penwell in Ector County; No. 1-B Riley, Devonian discovery west of Seminole field in Gaines County; and Humble 1-S University, which was a 487-bbl. Devonian discovery, or extension, north of Hutex field in Andrews County.

Gas Crimps Fuel Oil

Stocks are climbing on the West Coast as "imported" gas cuts into heavy-fuel markets; refiners showing concern

D. H. Stormont

LOS ANGELES. — California independent oil producers and refiners are alarmed by imports of a new sort. They fear the large new volumes of out-of-state natural gas being dumped on the state's fuel market.

These groups perennially find it difficult to sell their excess heavy crudes and residual fuels. Natural gas already being piped in from Texas and New Mexico has complicated the problem. The gas undercuts oil as a fuel for industrial and utility plant operations.

California oil men declare they have kept their inventories manageable only through abnormal shipments to the Atlantic seaboard—sometimes at a depressed price.

Current natural-gas imports from the Southwest total 1,400,000 M.c.f. daily. But three major California utility companies have announced they plan to step up deliveries by 100,000 M.c.f. daily late next year. Daily receipts by January 1959 are expected to total 1,850,000 M.c.f. This is an increase of 450,000 M.c.f. daily. *(See page 83.)*

This would mean that imported natural gas would constitute about 70 per cent of California's total gas supply.

Storage vs. dumping . . . But the importing companies—Southern Counties Gas Co., Southern California Gas Co., and Pacific Gas & Electric Co.—claim they need this new gas. It will meet rising peak-load requirements and a constantly increasing firm demand resulting from increased customers. Also the large transmission lines bringing in the gas need to be operated at a high load factor to be efficient.

California producers and refiners, however, have another solution for that problem. They believe the answer doesn't lie in bringing in larger volumes of gas much of which will be burned as fuel in power generation and industrial plants in place of locally produced residual fuels. They claim the utilities should send the gas to underground storage. This would step up pipeline efficiency. At the same time the gas could easily be withdrawn to meet peak loads and higher demands resulting from increased domestic uses.

Current gas imports are the energy equivalent of 212,000 bbl. daily of fuel oil. The new supplies would increase this by 23,000 bbl. Preliminary statistics show natural gas burned in power generation last year equaled 80,000 bbl. daily of fuel oil. That burned as industrial fuel equaled 98,000 bbl. daily.

In the view of oil men, most of the gas used for these purposes should have gone into underground storage. It could be withdrawn during peak-demand days in winter months. Cost of storage, the oil men claim, would be offset by the higher price paid by domestic consumers compared with the cheap rate given industrial users.

Back of the oil men's trouble, of course, is their heavy fuel oil inventories, resulting from the low-gravity crude produced in the state. During 1954 these inventories gained 8,500,000 bbl. By the first of the year their volume neared the 30,000,000-bbl. mark, the highest level since January 1950.

Oil demand off . . . Stocks in 1950 had hit a 40,000,000-bbl. peak but with the help of 6,500,000 bbl. shipped to the East Coast at distressed prices, they had dropped to 30,500,000 bbl.

Reduced demand rather than any spurt in output caused the inventory growth. Bureau of Mines figures for 1954 showed average demand declined 16,000 bbl. daily to total 350,000 bbl. Drops in demand for civilian uses included 15,000 bbl. daily in power generation, 11,000 bbl. less for railroad use, and 8,000 bbl. off for ship bunkering. Oil company use gained 7,000 bbl. daily and military demand climbed 5,000 bbl.

With stocks piling up, shipments of fuel were stepped up to Atlantic and Pacific foreign markets. From about 58,000 bbl. daily in November they went to 66,000 bbl. daily in December, climbed to 114,000 bbl. in January and reached 126,000 bbl. in February. For comparison, shipments for February a year ago totaled 69,000 bbl. daily.

These shipments to points outside the normal marketing area eased the overall West Coast residual problem, but not insofar as the small refiner is concerned.

Pricewise his situation is not good. As one refiner summed it up, products from California plants are being sold for less than ceiling prices in effect during the days of O.P.S. Posted crude prices are considerably higher so that the profit margin is extremely thin.

Small refiner hurt . . . The situation has caused three refineries in the Los Angeles area to close in recent months. These were the 4,000 bbl. Long Beach plant of Eureka Refining Corp., McAllen Refining Co.'s 5,000-bbl. Huntington Beach plant, and the 2,500 bbl. Venice plant of Triangle Oil & Refining Co. None had cracking facilities.

In two cases, they had long-term contracts with a large refiner to buy their topped crude at posted heavy crude prices. This provided them with an extra 15 cents or so per barrel. Failure again to get such favorable terms made their operations unprofitable.

Some of the large companies also faced with large stocks have become more aggressive. When the city of Los Angeles recently asked for bids on 60,000 bbl. of heavy fuel, a large refiner won out with an offer 30 cents below the posted market price.

The small refiner also is supplying less of the armed services jet fuel requirements. Until recently these contracts were negotiated. When the armed services switched to competitive bidding the larger refiners took a more active interest in this business.

Since the average crude charged to California plants is about 25° gravity, and is tending to decrease, the entire industry is faced with unusually high percentages of residual stocks. Large refiners are solving this through installation of greater catalytic cracking capacity and through coking operations. Lacking capital for these upgrading processes, the smaller companies will continue to wrestle with the residual problem.

Leasing Reforms Expected

SACRAMENTO. — California probably will have liberalized leasing and development laws when the legislature adjourns in June.

Four bills sponsored by the oil industry, and introduced by Rep. Joe C. Shell, Los Angeles oil man, have been passed by the assembly and sent to the senate.

The measures have been considerably rewritten since they were introduced. They no longer are objectionable to the State Lands Commission. A provision for the state to receive 12½ per cent royalty—making the amount of bonus the competitive part of bidding—has been retained.

El Paso to Boost Gas Flow Westward

- **Kayser to seek FPC approval this week on 34-in. loop of entire line from San Juan basin to California border**
- **If this fails, two alternate projects are proposed; Pacific Northwest will supply half of gas for expansion**

EL PASO, Tex.—El Paso Natural Gas Co. plans to increase capacity of its huge pipeline system to deliver an additional 450,000,000 cu. ft. daily of gas to expanding California markets.

Paul Kayser, El Paso Natural president, said the expansion program actually would add 550,000,000 cu. ft. daily to his firm's capacity. But 100,000,000 cu. ft. daily would bolster supplies in its Arizona, New Mexico, and West Texas market area.

The new gas will come from fields in West Texas and San Juan basin of New Mexico. Nearly half of it—or 250,000,000 cu. ft. daily—will be purchased from Pacific Northwest Pipe Line Corp. The rest will come from El Paso Natural's own sources.

Kayser said he will go before the Federal Power Commission this week to ask permission for the undertaking. He will present three possible projects:

. . . A 34-in., 500-mile looping line of present El Paso Natural facilities. This would carry 500,000,000 cu. ft. daily over a line starting south of Durango, Colo., and extending to the California-Arizona border at Topock. Some 50,000,000 cu. ft. daily would be handled over El Paso Natural's lines to the south.

This project will be the one most highly recommended by Kayser and Pacific Northwest. But Kayser reported if this did not win FPC favor, these two alternates would be offered:

. . . A 30-in. line connecting proposed Pacific Northwest facilities at Mountain Home, Idaho, and extending to the San Francisco area. This would handle the 250,000,000 cu. ft. daily Pacific Northwest has agreed to sell to El Paso Natural.

. . . A 30-in. line from Pacific Northwest facilities near Pendleton, Ore., on the Columbia River and extending south to California. This also would handle the extra 250,000,000 cu. ft. daily.

Kayser said if one of the two alternatives was approved by the FPC, El Paso Natural would move the remaining 200,000,000 cu. ft. daily to California through its southern pipeline system. He indicated the looping project would be necessary in any event.

The project is the result of one of the biggest natural-gas deals in history. It will link the U. S. West Coast with far-flung gas fields in Canada and the Southwest *(The Oil and Gas Journal, December 20, 1954, page 58)*.

Pacific Northwest started this week building a transmission line from the San Juan basin to the State of Washington. It is able to sell gas to El Paso Natural from its San Juan supplies because it has contracted to receive 300,000,000 cu. ft. daily from Westcoast Transmission Co., Ltd., of Canada.

Westcoast Transmission is planning a 650-mile trunk line from the Peace River area of northern Alberta and British Columbia to Vancouver, B. C. A short spur line will link these facilities to Pacific Northwest in northern Washington.

Plans changed . . . This means Pacific Northwest can supply its markets in Washington, Oregon, and adjacent areas with Canadian gas, releasing some of its San Juan supplies to El Paso Natural for use in California markets.

Original planning in the 3-way deal was for Canadian gas to enter the California market. But Kayser said those concerned felt it was more economical to put gas from the Southwest into California and Peace River gas into the U. S. Northwest.

El Paso Natural will deliver the additional gas at the border to its three big California customers—Pacific Gas & Electric Co., Southern California Gas Co., and Southern Counties Gas Co.

When completed, the projects will give the El Paso Natural system a total daily deliverability of 2,750,000,000 cu. ft., including sales in the field. The total California deliverability will be increased from 1,400,000,000 cu. ft. daily to 1,855,000,000 cu. ft. Its capacity in other markets will be pushed to 750,000,000 cu. ft. daily.

According to delivery schedules, El Paso Natural will deliver an extra 50,000,000 cu. ft. daily to Pacific Gas & Electric Co. on November 1, 1956. An extra 75,000,000 cu. ft. daily will start during 1957 and by January 1, 1959, P.G.&E. will be receiving 225,000,000 cu. ft. daily of new gas. Similar stepped-up delivery schedules are planned for the two southern gas companies.

Objections answered . . . All the proposals hinge on completion of Pacific Northwest's carrier line to the San Juan, construction of the Canadian line, and FPC approval of El Paso Natural's proposal.

The California distributing companies also will undertake construction projects to handle the additional supply. They must build further parallel lines and compressor installations.

F. M. Banks and G. W. Wadsworth, Jr., presidents of Southern California and Southern Counties, respectively, estimated this work on their part will involve a $31,000,000 outlay over a 3-year period.

Banks said the new supplies will demand a higher rate because of added costs. Present price being paid for gas at Topock is 24.4 cents per M.c.f. The new gas will cost about 27.5 cents.

Kayser explained El Paso Natural was undertaking the expansion because of the big demand for natural gas in California which domestic gas producers are unable to supply.

He declared it is El Paso Natural's policy to work closely with oil people in California. He added his company fully subscribed to the Natural Petroleum Council's policy that new natural gas should supplement rather than supplant existing fuel markets.

California oil men have protested that additional imports of natural gas into the state is undercutting their markets for heavy crude and residual fuels. *(See opposite page)*.

Gas Line Started

Six contractors get first part of Pacific Northwest

HOUSTON.—The 1955 phase of Pacific Northwest Pipeline Corp.'s 1,466-mile natural-gas line construction program has begun.

R. D. Ricketts, president of Fish Northwest Constructors, Inc., which will design and build the line, said por-

tions of the line let to six contractors would get under way this week.

The contracts totaling $11,236,000, cover the first eight sections between Ignacio, Colo., and Burley, Idaho. With the exception of about 100 miles of lateral lines, the contracts cover all the work on the line planned for this year. The contracts totalled 387 miles of 26-in. and 268 miles of 22-in. pipe.

The successful contractors are:

. . . **River Construction Corp.,** Fort Worth, Tex., two sections totaling 150 miles of 26-in. between Ignacio, Colo., and Moab, Utah.

. . . **R. H. Fulton & Co.,** Lubbock, Tex., two sections totaling 160 miles of 26-in. between Moab and Jensen, Utah.

. . . **Associated Pipeline Contractors, Inc.,** Houston, 77.6 miles of 26-in. between Jensen and Green River, Wyo.

. . . **A. J. Curtis Construction Co.,** Casper, Wyo., 82.8 miles of 22-in. from near Green River to Sage, Wyo.

. . . **B & M Construction Corp.,** Oklahoma City, 90 miles of 22-in. between Sage and Lava Hot Springs, Idaho.

. . . **Midwestern Constructors, Inc.,** Tulsa, 95 miles of 22-in. from Lava Hot Springs to near Burley, Idaho.

Related project . . . Construction is scheduled to start this spring on a 380-mile, 22-in. line that will connect with Pacific Northwest's line. Colorado Interstate Gas Co. will build the line from Denver to Rock Springs, Wyo., where it will meet Pacific Northwest.

Houston Contracting Co. has the only portion of the line let so far. It runs 126 miles from near Laramie, Wyo., to Denver. The completed line will transport 118 million cubic feet of gas daily, increasing the company's capacity to 690 million cubic feet.

Sinclair-Union Parley Set

DENVER.—Negotiators from Sinclair Oil Corp. and the C.I.O. Oil, Chemical and Atomic Workers International Union will meet May 26 in New York City to settle a dispute that led to union termination of the Sinclair contract early in April.

B. J. Schafer, union vice president and coordinator of the Sinclair council, said discussions will center on union demands for improved grievance procedure and additional limitations on awarding of work contracts to outsiders.

These demands held up final agreement on the Sinclair contract, largest in the industry. The two parties earlier had agreed to a 10-cent an hour across-the-board wage increase, plus improvements in sick benefits and group life insurance program.

Antidote For Disaster

Pipeliners at A.P.I. products conference told to stockpile repair equipment, train crews to prevent wartime damages

Paul Reed

CHICAGO.—Pipeliners should stockpile emergency repair equipment and train crews in wartime damage work.

C. B. Lester, Mid-Valley Pipeline Co., Longview, Tex., and H. T. Chilton, Jr., Service Pipe Line Co., Tulsa, gave that advice to 500 pipeliners at the sixth annual products pipeline conference of the American Petroleum Institute's Division of Transportation.

They declared pipeline firms should consider precautionary measures in view of international tensions. This is particularly important because pipeline systems are so vulnerable to attack and sabotage.

Lester and Chilton declared pipelines never can be fully guarded against sabotage, although they are relatively safe from air or artillery attack. Pump stations, however, can be guarded from saboteurs but are wide open to bombing or shelling.

The speakers advised companies operating in the same area to cooperate in stockpiling supplies and equipment needed for a speedy repair job to restore damaged lines. Lester stressed need for keeping handy portable engine-driven pump units and the fittings to get them onto lines quickly. They could be used not only for damaged pump stations but also to replace an electric station should a main-power plant be knocked out.

Fast repair jobs are not new to pipeliners, Lester pointed out. But in case of enemy attack, damage would be on such a larger scale than usual that crews trained in special work are necessary. They should know how to put stations, terminals, and lines back into operation quickly.

Other speakers filled in the delegates on such industry developments as coating trends, pipeline mapping, unattended stations, and federal control of natural-gas producers.

Coating trends . . . Coal tar is still the predominate favorite for pipeline coatings, Dean Glass, of Pure Transportation Co., reported. He has just finished a survey on coating practices of 27 large companies involving 65,000 miles of line laid since 1950.

Contrary to popular belief in the pipeline industry, use of asphalt coatings has declined in the past 5 years. Of 13,000 miles laid since 1949, about 65 per cent was coal-tar coated. Glass said the figure ranged from 20 to 50 per cent in the period from 1930 to 1950.

Over-the-ditch coating also is the odds-on favorite practice. More than 90 per cent of the 13,000 miles was coated over the ditch.

Pipeline mapping . . . Paul J. Gibbs, Great Lakes Pipe Line Co., explained that aerial photogrammetric methods are much better for pipeline maps than old style ground surveying. They offer greater speed, lower cost, more accuracy, and much more detail.

AN IMPOSING ARRAY OF SPEAKERS detailed developments in the products pipeline field at an annual A.P.I. conference in Chicago. The speakers were, left to right, H. T. Chilton, Jr., Service Pipe Line Co., Tulsa; C. B. Lester, Mid-Valley Pipeline Co., Longview, Tex.; T. V. Bockman, Plantation Pipe Line Co., Atlanta; W. K. Borland, Plantation Pipe Line Co.; Dean C. Glass, Pure Transportation Co., Chicago; Paul J. Gibbs, Great Lakes Pipe Line Co., Kansas City; W. J. Arnold, Pure Oil Co., Chicago; and J. R. Childs, Trans-Northern Pipe Line Co., Toronto.

Automation . . . The unattended station must "think for itself," according to T. V. Bockman, Plantation Pipe Line Co. He based his discussion on experiences at his company's five remotely controlled, electric-powered stations.

Bockman said each station must be designed to provide protection for itself and against hazards it may introduce to nearby units. Piping and other equipment which might leak should be housed in a substantial building with a concrete floor. A fan should draw in air through nonflammable filters.

By confirming all leaks under a station, they can be drained into a sump tank equipped with a float switch for shutting down the station when a high level is reached. He added that control gear for each station should be placed at a safe distance in a separate control building. An unattended station must be designed to "fail safe" under abnormal conditions.

Bockman said Plantation has found that electrical strain-gage pressure-sensing elements used to power the pneumatic controller are more accurate. He added they also require less maintenance than the hydraulic pressure sensing elements used at four of the stations. He reported that for future installations an all-electric controller and throttle valve will be devised to eliminate reliance on pneumatic controller and air-operated throttle valve. Recent installations of this kind reported on other pipelines indicate a trend to the all-electric type.

Meeting change . . . At the conclusion of the meeting it was announced that products and crude-oil pipeline operating men will combine for a meeting next year. The session will be called the annual pipeline conference and will be held May 14-16 at Houston. Papers on both products and crude-oil pipeline subjects will be presented.

Sunray D-X Enters Alaska

LOS ANGELES.—Sunray Mid-Continent Oil Co. has acquired Government oil leases on approximately 105,000 acres of land in Alaska.

Majority of the leases are located on the Kenai Peninsula and are near large blocks of land under lease to other oil companies. Several have announced intention to conduct geological and geophysical exploration during the summer months.

Sunray Mid-Continent, in addition to the Kenai leases, also has acquired a 2,500-acre lease in the Wide Bay area which is separated from the Kenai Peninsula by the Cook Inlet.

The Kenai acreage was acquired by assignment from a group of San Francisco Bay area investors represented by LeRoy H. Hines, petroleum consultant.

Jet Fuel Explosive

Pipeliners report slower pumping solves ticklish problem; this keeps static electricity from igniting tank vapors

Robert G. Deering

CHICAGO.—Handling jet fuel is dangerous business and pipeliners eagerly exchanged ideas here last week on how to move the fuel without explosions.

The jet fuel problem was featured in a panel discussion held during the annual A.P.I. products pipeline conference here.

Delegates attending pointed out that pumping JP-4 jet fuels into tanks at a high rate is particularly hazardous. Likelihood of an explosion results from static electricity arcing across the liquid surface and igniting vapors. Some cone-roof tanks in jet fuel service have been blown up.

Observers have realized for a long time that static charges build up when petroleum is pumped. But there hasn't been cause for too much concern until recently when pipelines began handling large amounts of jet fuels. This fuel has a vapor pressure of only 3 psi., just right to cause an explosive mixture in an empty tank. Vapors from gasoline in a tank usually are too rich to explode.

Precautions . . . So, with the explosive mixture and the potential spark from static buildup, pipelines are taking special precautions with the JP-4. One company pumps it in a tank at a very slow rate. This means less agitation, less static charge, and consequently less chance of a static discharge or spark. The rate used varies from 50 bbl. per hour for the first 3 in. of tank fill, then 100 bbl. per hour for the next 2¾ ft., then full line rate. Filling is through the tank's water drawoff connection until liquid is 3 ft. high in the tank.

Another company reports initial filling rates of 500 bbl. per hour until 3 ft. is reached, then full-line rate. This company uses swing lines for filling, and the discharge can be placed on bottom.

One company representative stressed that even if JP-4 is pumped into floating roof tanks, the danger still exists. The floater acts just like a cone roof until the roof lifts clear of its legs.

Station protection . . . Should products-pipeline stations have elaborate fire extinguishing systems? Generally, pipeliners at the meeting feel such systems are unwarranted. There has never been a case of a station being destroyed by fire. As one engineer put it: "Station designers have always concentrated their efforts to see that a fire never gets started. Then there's no worry about having to put one out."

Open-air stations . . . Though there seems to be a trend toward open-air pump stations, many pipeliners express strong opposition to the principle. They feel savings over housed stations is very small if a safe weatherproof installation is made. Also, maintenance is difficult, expensive, and not as efficient, particularly during bad weather. Often the disadvantages rule out open-air stations except for very small installations, such as those for crude gathering.

New methods . . . A new instrument, called a Nepthelometer, is being used by one company to measure sediment content of products. In the device, products flow through a glass chamber which has a light shining through it. A photoelectric cell on one side picks up the direct light rays. A cell on the other side receives light reflected from suspended solids in the fluid. The ratio of the cell outputs gives a measure of the solid content.

Totalizers for meters . . . Various companies are working on a half a dozen ways to totalize a bank of meters automatically so that one indicator will show net barrels at 60° F. Potential savings are great. Some station or terminal operators now spend about three-fourths of their time making meter calculations.

Christmas trees crops? . . . A potentially important case has developed in the East concerning a landowner's rights to grow trees on a pipeline right-of-way. The owner claims they are Christmas trees to be harvested and sold in about 7 years. Thus, he claims, they are "crops" which he is allowed to plant under terms of his R.O.W. agreement. The pipeline company claims that "crops" mean something to be harvested each year.

This could be important to a company operating through timber land. An owner might want to start a pine tree farm on pipeline right-of-way. Pine trees take about 20 years to mature—a long time to be without a clear right-of-way.

Spencer Plant Dedicated

Observance of Chemical Progress Week has real meaning at Orange, Tex., along fabulous "Petrochemical Row"

ORANGE, Tex.—To the 25,000 residents of this thriving Gulf Coast city, Chemical Progress Week had deep significance — the kind that can be measured in dollars and cents.

The week-long celebration opened with dedication of Spencer Chemical Co.'s multimillion dollar polyethylene plant, the newest in a string of imposing industrial giants which comprise "Petrochemical Row."

The new plant is symbolic of the growing importance of polyethylene, so-called "miracle plastic." It is designed to produce 45,000,000 lb. of polyethylene resin a year.

Like the petrochemical industry itself, the new Orange plant sprang up suddenly. It emerged from the drawing board to a mammoth reality in only 21 months.

Gerald L. Farrar, engineering editor of The Oil and Gas Journal and principal speaker at last week's dedication ceremony, pointed out that the rapid growth of the chemical industry has given birth to a new industrial revolution in this country.

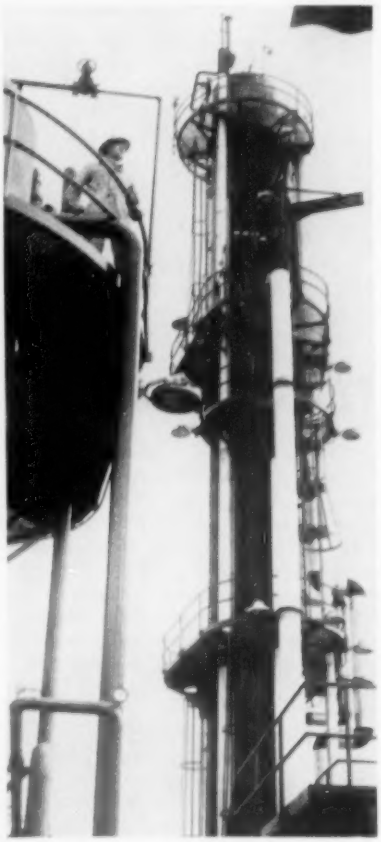
"New products, new plants, new jobs, new wealth have been created, it seems, almost overnight," said Farrar. "And yet the growth has not been haphazard or without purpose. It is making us a richer nation at every turn, improving our standards of living, our health, our leisure, and our personal well-being."

Present investment in chemical plants along the Texas-Louisiana Gulf Coast amounts to more than $2,000,000,000. Completion of some 70 other projects now in the planning or construction stage will add another $500,000,000 to the investment.

Industrial revolution . . . Investment in U. S. chemical plants since October 1954 totals more than $2,750,000,000, including plants now planned or being built, Farrar said.

"The significance of this amount is made crystal clear when we realize this figure practically equals the entire amount spent by the Government through the WPA to revive a sick American economy in the critical years of 1935, '36, and '37," he added. "Who will deny that growth on this scale certainly gives us license to talk about an industrial revolution?"

Residents of Orange couldn't escape "chemical progress" if they wanted to, Farrar said. "Some 80 per cent of the country's petrochemical productive capacity is on the Texas-Louisiana Gulf Coast, stretching from Brownsville, Tex., to Lake Charles, La. No other single community in this area has enjoyed a more rapid and vigorous expansion than Orange, Tex."



DISTILLATION tower at new Orange plant.

Farrar pointed out that the market for polyethylene has grown at a fantastic rate since World War II. "This new plastic has become the bellwether of the plastic industry," he added. "Industry prophets predict that it will be the first plastic to achieve a billion-pound-a-year market."

Discovery of product . . . The history of polyethylene dates back to the early 1930's. Chemists in the British laboratories of Imperial Chemical Industries, Ltd., are believed to have been the first to make polyethylene. And they did it by accident.

While conducting an experiment, these chemists tried to polymerize liquid ethylene and an aldehyde compound under very high pressure. They found the aldehyde unchanged by the experiment, but some of the ethylene had been converted into a white solid material.

This product, now known as polyethylene, was developed during World War II for insulating radar circuits. Use of the plastic soon spread to the U.S., where Union Carbide & Carbon Corp. had developed an alternate method for making polyethylene.

After World War II, use of the new product was limited for several years because of a patent dispute. This obstacle was not cleared until July 30, 1952. Since then, the demand for polyethylene has soared. It is now produced in vast quantities, not only for such uses as electrical insulation but also in making common household items like squeeze bottles for cosmetics, food containers, and ice-cube trays. The list of items made from the versatile plastic is growing almost daily.

History of company . . . The growth of Spencer Chemical Co. almost parallels the growth of the petrochemical industry.

The company grew out of the old Pittsburg & Midway Coal Mining Co. which, during World War II, operated a government-owned anhydrous-ammonia and ammonium-nitrate plant near Pittsburg, Kans. Vice president and general manager of the company was Kenneth A. Spencer, now president of Spencer Chemical.

The Kansas plant, known as the Jayhawk Works, converted from wartime to peacetime production in 1946. Name of the company was changed at the same time to Spencer Chemical Co., and the young firm set its sights on new industrial horizons.

The company continued to lease the Jayhawk plant until June 1948, then bought it from the Government. The plant's nitrogen-rich products soon found a new market as agricultural fertilizer, and the company rapidly began to expand.

The Jayhawk plant was enlarged as demand arose for allied products. In addition, the company has added several new plants—at Calumet City, Ill., in 1949; at Henderson, Ky., in 1950; at Vicksburg, Miss., in 1953. Plans for the latest addition, at Orange, were announced in March 1953, and construction started in the summer of the same year.

Ethylene used in manufacture of polyethylene is derived from oil and gas. This raw material is supplied to the Orange Works by pipeline from Gulf Oil Corp.'s refinery at Port Arthur, Tex.

June Allowable Cut

Louisiana official blames reduction on imported oil

BATON ROUGE.—Louisiana will slash its June production allowable 48,000 bbl. daily, and "excessive imports of virtually tax-free foreign oil" are getting the blame.

John B. Hussey, Louisiana's conservation commissioner, fired a broadside at importers last week in making the announcement of lower production in his state. He said tax advantages enjoyed by foreign oil amount to a subsidy to foreign producers that is stifling the domestic oil industry.

Hussey said the 48,000-bbl. daily cut for June will cost the State of Louisiana about $10,000 daily in severance taxes. He said taxes on imported oil last year were barely one-sixth as much as the income received by the federal Government from royalties, rents, and bonuses from lands off Louisiana.

Louisiana's current allowable is 708,671 bbl. daily and has been held at about that figure since January. The only increases have been to make room for production from new wells.

Gravity is disputed . . . Hussey disputed what he called claims by major importers that they are bringing in only heavy-gravity fuel oils.

Here is the record he cited:

. . . Seventy-eight per cent of the imports planned for June, as reported to the Texas Railroad Commission, for states east of the Rocky Mountains will be 25° gravity or lighter.

. . . The 202,000-bbl. daily increase in imports since 1950 has been almost entirely in the 25°-gravity crudes or higher, according to the National Petroleum Council's 1955 report.

. . . Foreign oil refined on the East Coast increased from 31.1 per cent in 1946 to 56.8 per cent last year.

Seepage Threatens Storage

WASHINGTON.—Panhandle Eastern Pipe Line Co. has run into a serious seepage problem in its Waverly, Ill., storage field.

Gas stored in the St. Peter sandstone at a depth of 1,800 ft. is seeping into higher formations. The company had banked on the field as a source of gas supply next winter. With the probability that the field will not be usable this year, it is making alternative plans which officials thus far have refused to disclose.

The Waverly storage field, expected to cost around $5,000,000, was part of Panhandle's big expansion program now under study by the Federal Power Commission. The company has asked the FPC to delay further hearings until new tests have been finished.

The company put two billion cubic feet of gas into the field last summer for testing. The storage at first appeared tight. Later it was found gas was seeping upward. No gas has come to the surface. But its migration means that if the field can be used at all it will hold less gas than originally estimated. If it is decided the field cannot be used for storage, most of the gas can be recovered.

Industry Briefs

PAMPA, Tex. — Celanese Corp. of America will double its vinyl acetate capacity here June 1. Increased output will go into manufacture of adhesives, coatings, and water-base paints. A new unit also is being added to synthesize methyl ethyl ketone.

NEWCASTLE, Wyo.—Black Thunder Oil, Inc., of Newcastle changed its name last week to Black Thunder Oil & Uranium, Inc. Russell H. Twiford, president, said the new name was adopted after the firm leased 36 uranium claims in Campbell County, Wyoming.

WASHINGTON.—The Federal Power Commission has authorized merger of two wholly owned subsidiaries into Texas Gas Transmission Corp., Owensboro, Ky. The subsidiaries are Louisiana Natural Gas Corp. and Texas Northern Gas Corp., both engaged in acquiring natural-gas reserves and transmitting them to the parent company.

AUSTIN.—The Texas Railroad Commission will hold a hearing here June 13 to determine classification for a large number of petroleum-derived chemicals for motor freight purposes. If these chemicals, including acetic anhydride, xylidine, etc., should be placed in the petroleum classification, tank truck operators now permitted to haul petroleum and certain products also could handle bulk shipment of the chemicals.

WASHINGTON. — A bulletin on construction practices for oil and products pipelines has been published by the division of transportation of the American Petroleum Institute. It presents recommendations designed to improve specifications and contract practices in building pipelines.

DENVER.—Colorado's booming oil and gas industry has pumped $1,746,913 in new revenue into the state treasury during the first quarter of this year. Total income from the oil and gas severance tax was $4,532,483.

AMARILLO, Tex. — The weighted average wellhead price for natural gas used for fuel purposes in Texas Panhandle field is 9.7522 cents an M.c.f. at 16.4 psi. The charge for desulfurizing it is ½ cent an M.c.f., the Texas Railroad Commission decided last week. The average wellhead price, under Texas law, automatically becomes the minimum price which must be paid for Panhandle gas consumed in the manufacture of carbon black.

SAN ANTONIO.—A group of Texans from San Antonio, Dallas, and Corsicana, has organized Subsurface Reserve Co., a $1,115,000 producing concern. All the company's holdings are in South Texas except for one lease in Nebraska. President is Morris Cannan, San Antonio independent. Robert D. Mebane, a San Antonio oil man, and A. F. Mitchell of Corsicana are vice presidents.

HAMMOND, Ind. — Work has started by Calumet Nitrogen Products Co. on the first nitrogen products plant in Indiana and the largest in the United States to make anhydrous ammonia from refinery byproduct hydrogen. The plant will convert 100 tons daily of anhydrous ammonia into nitrogen solutions, used as a base for mixed fertilizers. Calumet is owned jointly by Sinclair Refining Co. and Standard Oil Co. (Ind.) and will be supplied byproduct hydrogen by pipeline from the firms' two refineries nearby.

OKLAHOMA CITY.—Gulf Coast Western Oil Co. has purchased a one-half interest in a Colorado uranium-producing property in Rio Blanco County. F. R. Henson, president of Gulf Coast, did not disclose the amount his firm paid for the property. Gulf Coast owns 36 producing properties with 67 oil and gas wells in Oklahoma, Texas, Kansas, and New Mexico.

COLLEGE PARK, Md. — A new building housing the Asphalt Institute has been officially dedicated on the University of Maryland campus. Former Congressman Jennings Randolph gave the keynote address at ceremonies. J. E. Buchanan, president of the institute, accepted the structure from Judge William P. Cole, Jr., chairman of regents for the university.

TRANSPARENT model of the new Super Jet. The actual carrier is aluminum and is expendable. Charges are of new design, short enough to be placed in the carrier horizontally. This means deeper penetration than possible in earlier models in which charges had to be placed at an angle (see cut above).

More-powerful punch promised by . . .

. . . Slim-Hole Perforator

Edwin McGhee

HOUSTON. — Small-diameter perforating guns are getting more powerful. Latest addition to the tools for perforating casing below tubing is a high-power, fixed-charge gun—which fires horizontally.

The trouble in designing small-diameter perforators has been that the old, conventional shaped charges were too long. When placed horizontally in a gun, these charges made the over-all diameter too big to run inside tubing. While these charges work fine in casing-type perforators where diameter is not so critical, a new approach had to be made for the tubing gun.

Now, with a new, shorter design for the shaped charges, the "Super Jet," as it is called, has its charges fixed horizontally but is still small enough to run inside tubing.

There are models for both 2-in. and 2½-in. tubing. Moreover, the individual "jets" carry more explosive than do older, conventional perforators. Therefore, the new gun gets good penetration into the formation. It was developed by Schlumberger Well Surveying Corp. and now in field use.

For permanent completion . . . The permanent-type completion is being used in a fast-growing number of Gulf Coast wells.

In these operations, all work, including perforating, is done with wireline tools through the tubing. However, when the idea for this kind of completion was suggested about 3 years ago, there was no perforator for the job. The perforating gun had to be small enough to run through the tubing yet powerful enough to penetrate the casing, the cement behind it, and part of the formation.

The first gun that would fit these requirements used more-or-less conventional shaped charges. However, to make them fit in the small gun, the charges had to be placed at a 45° angle. As a result, they would not penetrate the formation as deeply as would a horizontal jet of the same power. While this tilted-charge gun did most jobs well, improvement was in order.

Like a few earlier guns, the new Super Jet is expendable. Its tubular carrier is aluminum and, therefore, does not have to be retrieved from the well after firing. The well fluids will dissolve the pieces of the gun left in the hole. Caustic solutions will do a quicker cleaning job if needed.

Kermac Forms Subsidiary

TULSA.—Kerr-McGee Oil Industries, Inc., has formed a company to operate all refining, marketing, and pipelining facilities acquired recently from Deep Rock Oil Corp.

The subsidiary company will be called Deep Rock Oil Co. and will headquarter in Tulsa. Deep Rock Oil Corp., from which Kerr-McGee purchased $17,000,000 worth of assets, will be renamed.

The new company will operate two refineries in Oklahoma. One is Kerr-McGee's 15,000-bbl. plant at Wynnewood, the other is the 19,000-bbl. refinery at Cushing formerly owned by Deep Rock Oil Corp.

F. C. Love, general vice president of Kerr-McGee, will be president of the subsidiary. Five vice presidents also have been named. They are John G. Campbell, Robert M. Chesney, James J. Kelly, William M. Murray, and Jack W. Roach. Kelly will also continue as vice president of the parent company.

Liquidation Plan Upheld

WILMINGTON, Del. — The Delaware Chancery Court has upheld liquidation and sale of assets of North Central Texas Oil Co. Minority stockholders, dissatisfied with the liquidation distribution of $29 per share, filed suit in two states. A decision is still pending in New York Supreme Court, Kings County.

The royalty-holding company produces about 1,050 bbl. daily of crude, has reserves of about 6,000,000 bbl., and a capitalization of about $2,300,000.

Harris Bill Weakened

New provisions would give FPC limited control over gas prices at wellhead; compromise measure pushed in Senate

Bertram F. Linz

WASHINGTON.—Provisions to protect natural-gas consumers have been written into the Harris bill exempting producers from price control.

The House interstate commerce committee formally adopted a policy previously approved tentatively. It would give the Federal Power Commission a measure of control of wellhead prices by requiring it to pass on price increases arising out of most types of escalation clauses in contracts between pipelines and producers.

Price increases would automatically be permitted only if they were based on clauses providing for specified increases at fixed periods or to cover new or increased taxes on producers.

The FPC would pass on all increases arising out of other types of escalation provisions. It would approve only increases or such part of them which did not bring rates to producers in excess of the "reasonable market price."

Not in final form . . . The provision is still to be written in final form. Some committee members feel it must be worded so as to make sure the pipelines are not squeezed by having to pay producers more than the FPC will permit them to pass on to distributing companies and eventually the consumer.

Committee Chairman J. Percy Priest of Tennessee said revision might be necessary. Rep. Oren Harris of Arkansas, author of the bill, disagreed. He said the companies probably could protect themselves through renegotiation of contracts or court action.

The escalation provision is aimed at meeting the objections of consumers to exemption of independent producers from price regulation.

Committee members said it would relieve their fears that the bill would permit unlimited producer-price increases that would cost consumers hundreds of millions of dollars.

Senate move . . . Meanwhile, a drive for "modified" control of independent producers' gas prices is being organized in the Senate by Sen. Paul H. Douglas of Illinois.

Douglas is backing a bill which would limit price control by the Federal Power Commission to producers of more than 2,000,000 M.c.f. of gas per year. A similar bill was filed in the House early in the session by Rep. John Heselton of Massachusetts.

Under the bill, 4,191 of the 4,365 independent producers who sold to interstate pipelines in 1953 would be exempt from regulation. The remaining 174 producers sold 90 per cent of the gas moving in interstate commerce, Douglas said.

Douglas offered his bill as opponents of the Harris bill marshaled their forces for testimony before the Senate interstate commerce committee. The hearings last week were devoted to objectors to the Harris bill, which would exempt independent producers from FPC regulation.

Constitutionality . . . Douglas backed his proposal with a 1949 memorandum from the FPC law bureau holding that regulation based on classification would be constitutional. The FPC opinion was written when Douglas made the same recommendation during consideration of the Kerr bill, which was passed by Congress and vetoed by former President Truman.

The opinion pointed out that this type of regulation had been adopted in other cases. The Supreme Court held it constitutional in the case of railroads, in which lines of less than 100 miles in length were exempted.

FPC figures secured by Douglas show that in 1953 the pipelines had 3,736 suppliers who individually produced less than 100,000 M.c.f. a year. Another 402 suppliers produced less than 1,000,000 M.c.f. a year, and 53 produced between 1,000,000 and 2,000,000 M.c.f.

Big producers affected . . . The pipeline companies and their affiliates produced less than 22 per cent of the gas they transported. In 1947 they had produced 43.28 per cent. The drop was not due

Biggest Suppliers of Gas to Interstate Lines

(Source: Federal Power Commission study, 1953 sales)

No. Producer—	Sales (M.c.f.)	Per cent of total sales	Cumulative
1. Phillips Petroleum Co.	457,445,147	10.77	10.77
2. Stanolind Oil & Gas Co.	202,562,446	4.77	15.54
3. Humble Oil & Refining Co.	175,975,859	4.14	19.68
4. Magnolia Petroleum Co.	157,553,211	3.71	23.39
5. Shell Oil Co.	156,356,923	3.68	27.07
6. Chicago Corp.	155,561,811	3.66	30.73
7. Gulf Oil Corp. and subsidiary	138,437,426	3.26	33.99
8. Atlantic Refining Co.	95,201,494	2.24	36.23
9. Shamrock Oil & Gas Corp.	81,394,405	1.92	38.15
10. Skelly Oil Co.	74,650,656	1.76	39.91
11. Sun Oil Co.	69,020,225	1.62	41.53
12. The Texas Co.	67,405,381	1.58	43.11
13. Carthage Corp. plant	66,589,144	1.57	44.68
14. Republic Natural Gas Co.	63,245,423	1.49	46.17
15. Superior Oil Co.	62,533,698	1.47	47.64
16. Sunray Oil Corp.	53,734,890	1.26	48.90
17. Union Oil Co. of California	53,023,345	1.25	50.15
18. Continental Oil Co.	52,868,918	1.24	51.39
19. Southwest Gas Producing Co.	50,798,484	1.20	52.59
20. Panoma Corp.	48,606,770	1.14	53.73
21. La Gloria Corp.	48,016,833	1.13	54.86
22. Pure Oil Co.	48,002,992	1.13	55.99
23. Ohio Oil Co.	47,761,245	1.12	57.11
24. Abercrombie, J. S., Co.	46,947,330	1.11	58.22
25. Tide Water Associated Oil Co.	45,380,214	1.07	59.29
26. Sinclair Oil & Gas Co.	43,449,336	1.02	60.31
27. American Gas Production Co.	43,283,875	1.02	61.33
28. Southern Production Co.	42,116,644	0.99	62.32
29. Western Natural Gas Co.	39,228,299	0.92	63.24
Total 29 producers	2,687,152,424	63.24	

The volumes reported for most of the producers include some gas sold jointly with others.

to a decline in production, which actually increased 31 per cent. It was due to 163 per cent demand growth.

Close to 50 per cent of all the gas taken by pipelines other than on the Pacific Coast was produced by 29 companies, most of them oil producers. These companies sold 63 per cent of all the gas purchased by the pipelines in 1953. The five top sellers, all oil companies, accounted for 27 per cent.

Douglas said that regulation under the Phillips decision would bog down the FPC in an "administrative morass." It would impose expense and effort on the small producers beyond that required by the public interest.

The 1953 sales of the 29 top producers are shown in the accompanying table.

Coal will fight . . . The coal industry will make a drive in the Senate as well as the House to curb industrial sales by the pipeline companies. The move will be headed by Sen. Harley M. Kilgore of West Virginia.

Kilgore has written a bill which he says will aid in the "conservation" of natural gas. "As a nation," he explained, "we may have already passed the peril point in exhausting our natural gas reserves. I believe it is an issue which should be examined by the committee during the hearings now under way."

The bill would give the FPC control of direct industrial sales, with a mandate to prohibit "dump" sales at less than cost. It would also require importers of natural gas to meet the same standards that govern transporters of domestic gas.

Kilgore pointed out that natural-gas sales have increased 660 per cent in the 17 years since the Natural Gas Act was adopted. "In the light of this growth, the depletion of our reserves, and the experience gained in administering the act, the Senate should take a good, long look at the situation before passing any legislation," he said.

U. S. Asks to Study Mergers

WASHINGTON.—The Department of Justice wants the right to study all industrial mergers before they are completed.

It wants a law, too, to compel businessmen to open their books to the Government in civil antitrust cases.

Aims of the department were laid before the House judiciary committee by Assistant Attorney General Stanley N. Barnes, head of the department's antitrust division. Barnes said the department should be notified in advance of all planned mergers so that it may study the possibilities of antitrust violations.

WATCHING WASHINGTON

Bertram F. Linz

Action Near on Controls

The administration's plan to provide standby price and wage controls may go to Congress next month. But officials have let it be known formal controls will be the last step, not the first, in gearing the economy for an emergency.

President Eisenhower's cabinet approved the idea some time ago. It has been held up for two reasons. First, the country might interpret it as a sign the Formosa situation was very serious. In fact, the plan has no relation to conditions in the Far East. It is planned as permanent law, available in the future.

The other reason for delay is the possibility of a long controversy in Congress over grant of such an unusual power to the President. By holding back, this time is shortened.

The Government has worked out a comprehensive program for economy controls under any type of emergency conditions. In less than outright war, even if a "police action" developed, indirect controls could be used. These would tighten the economy with increased interest rates, credit restrictions, etc.

But it is realized an enemy attack might outmode all advance planning. In that event, the Government would have total authority under the proposed bill. This power, worked out by the Office of Defense Mobilization, would permit the immediate freezing of prices and wages. It would lay the way for rationing. Distribution of materials could be controlled under provisions already in the Defense Production Act, and the price and wage controls would be part of that law.

Iranian Opinion Sealed

The Attorney General's advisory opinion on the Iranian oil agreement has been sealed by the National Security Council.

Assistant Attorney General Stanley N. Barnes told the House judiciary committee this month he could not disclose its findings. He said it had been classified "restricted" by the NSC.

But Barnes told the committee he did not agree with published statements that the Government had given a blanket bill of health to the participating American companies. He indicated they had not been given immunity from the antitrust prosecution.

The agreement came up for discussion when Chairman Celler tried to dig into the cartel suit brought by the Government in 1953. The five companies in the Iranian consortium are defendants in that suit.

The Justice Department gave its approval to participation in the international agreement early last year after the companies told the State Department they were willing to cooperate but only if protected against prosecution for their participation. The matter came before the NSC, which reportedly said the agreement was in the interests of the United States.

AF Goes Underground

Experiments in underground storage have worked so well that the Air Force will test it further.

The Armed Services Petroleum Purchasing Agency is asking bids for salt-cavern storage of 300,000 bbl. of jet fuel in the area of McPherson or Wichita, Kans.

The Air Force stored 60,000 bbl. of fuel in a Kansas salt cavern about 2 years ago. The loss factor was sufficiently low to encourage a more extensive operation. ASPPA is now looking for a contractor who will find a cavern and fix it up, providing the facilities and service on a contract basis.

War Potential Survey

Defense officials are winding up a survey that will pinpoint the effect of a bombing attack on ability of essential industries to meet wartime demands.

The study is part of the civil defense planning program. It has been under way for several months. It will bring together, for the first time, the essential information on industry capacity needed in the event of enemy attack.

The data is being compiled in such a a way that should any particular city or area be knocked out, the Government will know at once just what percentage of production in a particular line has been lost.

The chemical industry, including petrochemical plants, is one of those covered by the survey. Location and capacity of oil refineries are pretty well known already.

Lone Star Deadline Set

Firm has until July 1 to supply FPC with reserve figures backing bid to lay two lines to serve Natural Gas Pipeline

WASHINGTON.—The Federal Power Commission has given Lone Star Gas Co. until July 1 to submit reserves figures backing up a pending official application to supply natural gas to Natural Gas Pipeline Co. of America at Fritch in the Texas Panhandle.

In a brief hearing last week, Lone Star informed FPC that the report on its reserves will be completed early in June. The company said it has had assurance of this from DeGolyer & MacNaughton, Dallas consulting firm, which is preparing the report.

Lone Star officials said in Dallas the reserves figures are all that it lacks, according to FPC, to complete an acceptable application for a permit to lay a 230-mile transmission line from Cotton County, Oklahoma, to Fritch.

The company also plans to apply for a permit to lay a 205-mile line from Snyder in West Texas to hook up about 60 miles east of Fritch with the artery from Cotton County.

These two lines would supply Natural Gas Pipeline Co. or others with up to 200,000,000 cu. ft. of gas per day to start *(The Oil and Gas Journal, May 16, page 134)*.

Natural Gas Pipeline, however, is actively pushing an application already accepted by the commission to lay a line of its own from Fritch to tap gas reserves in Jack and Wise counties in North Texas.

The bulk of this supply was developed by a group of Texas independents including Christie, Mitchell & Mitchell, Houston, and Miles Production Co., Dallas. Natural Gas Pipeline also has smaller amounts of gas under contract in the area from Warren Petroleum Corp. and Sunray Mid-Continent Oil Co., both of Tulsa.

Dates set for briefs . . . The FPC closed oral argument last week on the Natural Gas Pipe Line application and fixed May 23 as the deadline for filing briefs by this company and the producers.

Lone Star, the city of Chicago, and other intervenors in this case will have until June 27 to file their original briefs, which may include replies to the Natural Gas Pipeline and producers' briefs. Natural Gas Pipeline and the producers must file final reply briefs by July 5.

The July date makes it possible that proceedings on separate Lone Star and Natural Gas Pipeline applications may be going on simultaneously. It is likely, though not definite, that the commission may consolidate the two after Lone Star's application becomes formally complete through addition of reserves figures. The commission is not expected to rule on the Natural Gas Pipeline case until it has heard Lone Star's application.

U. S. Advised to Quit Helium

WASHINGTON.—The Hoover commission on government organization said last week the Interior Department should get out of the helium business.

It also said that the department should limit its oil-shale research to the development of cost data.

The Government got into the helium business in 1918 when it built plants to process the gas for lighter-than-air craft. Since 1938 the Government has had a complete monopoly. The investment in plants has been about $23,000,000, of which $6,000,000 was provided in 1954 to build a new plant. The use of gas for aircraft still is big, but the largest use now is for shielded arc welding. The Government itself uses about 85 per cent of the output *(The Oil and Gas Journal, December 6, page 82)*.

The Interior Department has been interested in oil from shale for several years. In 1944, during the wartime oil shortage, Congress approved a big-scale effort, providing $30,000,000 for the work. Some $20,000,000 was spent in construction and operation of a plant at Rifle, Colo., which the department now plans to shut down.

Gas Line Verdict Appealed

WASHINGTON.—The Supreme Court has been asked to take a hand in the fight for the multimillion dollar Detroit natural-gas market.

Panhandle Eastern Pipe Line Co., which is fighting the proposed Louisiana to Michigan project of American Louisiana Pipe Line Co., has taken the battle to the tribunal. Panhandle is asking the court to review a decision of the Third Circuit Court of Appeals.

The Circuit Court refused to hear Panhandle's case against American Louisiana and also ruled the company had no right to intervene in the American Louisiana hearings before the Federal Power Commission.

American Louisiana, a subsidiary of American Natural Gas Co., received FPC permission for the line last fall. Four companies got FPC approval this month to furnish the gas. Panhandle charges that if line is built American Natural would have a monopoly on the Detroit and Wisconsin areas.

Pipeline Revived

Short claims new backing for Texas-California line

WASHINGTON. — The long fight over the proposed West Texas-California crude pipeline appears to be slated for a congressional airing.

Rep. Dewey Short of Missouri, ranking Republican member of the House armed services committee, asked the rules committee last week to approve his resolution for a study of wartime oil sources and supply on the West Coast in wartime. The committee took no action, but it is believed the Armed services committee would make the study any way under its general authority.

Short told the rules committee the West Coast would have a severe shortage of oil in an emergency. Even now, he said, it is importing 50,000 bbl. daily.

He charged the Government agencies have been "dragging their feet" on the question of a pipeline to the Pacific Coast. He said they are depending too much on imports and should have gone ahead with a pipeline long ago.

Building of a big-inch crude line was proposed more than a dozen years ago by L. M. Glasco of West Coast Pipe Line Co., Dallas. Glasco wanted the Government to help with the financing, but the Defense Department repeatedly refused to endorse the project.

But high officials of the department now favor the line, Short said. Planes, bases, and ships would be useless in wartime without the oil to run them, he pointed out.

Short said Chairman Carl Vinson of Georgia has agreed the inquiry should be made. It will probably be run by a subcommittee headed by Rep. F. Edward Hebert of Louisiana.

Small-Tanker Bids Asked

WASHINGTON.—Bids for the construction of two small tankers will be opened by the Maritime Commission July 29.

The tankers will be used by the Navy Department in Arctic waters. They will be ice-strengthened and have special equipment for cold weather.

On an Island in Sea of Mud . . .

. . . Drillers Defy Muskeg

CALGARY.—Texaco Exploration Co. engineers have borrowed an offshore drilling technique to keep operating in the muddy morass of Canada's muskeg country during spring thaws.

Texaco started drilling directionally from an island platform built up in the sea of mud.

The idea was born of necessity, however. One Texaco rig drilling in Alberta's Pembina field stayed on the job a little too long. Spring came and the warmer weather thawed frozen muskeg into a jelly formation. There was no way of getting the equipment out. So the engineers sought a way to keep drilling during the summer—usually a shutdown period in muskeg country.

They turned to island drilling used by U. S. firms for offshore operations in coastal waters. Crews hauled mud and clay to the rig location and packed it into a 400 by 550-ft. island 7 ft. high. This clay platform after it hardened floated on the mud and supported the 200,000-lb. drilling rig and 750,000 pounds of other equipment.

Several holes can be drilled directionally from the location.

Texaco officials quickly explain the new technique is simply an experiment born of necessity. They have no information on costs, adding it is too early yet to determine if the method is a success.

The island's platform drilling plan, however, has provoked much interest in Canadian oil circles. It could provide valuable data for financial and engineering study. Much of Alberta's known oil deposits lie under muskeg. Success of the Texaco experiment would prove a great boost to the possibility of recovering the rich formations.

Holders of drilling rights in Pembina field would benefit particularly by the success of a summer drilling technique. The field has been rated one of the richest on the North American continent but muskeg has hurt its chances for full development.

One Texaco official in the field stressed that the experiment was not born of a scientific union. He said members of the rig would naturally benefit from their experience on the platform but that no definite goal had been set. He stated that as long as the weather kept the rig there, Texaco would keep drilling. When the weather clears the rig will be moved to another job and the accidental experiment will be ended.

Wax Plant Planned

Imperial will produce new product at Sarnia refinery

SARNIA, Ont.—Imperial Oil, Ltd., is spending $4½ million for a new wax plant at the company's 86,580-bbl. per day refinery here. The new plant will produce 35 million pounds per year of all types of microcrystalline and paraffin waxes.

Included will be an entirely new type, the first of its kind in the world, according to general superintendent J. L. Huggett. This new product has a very low melting point, a high gloss, and is extremely pliable. It is expected to find use in the "heat bath" treatment of arthritis and could also be used as a vegetable coating and a cosmetic base.

Another wax has been developed at Sarnia. It has a high melting point of 180° F. and a high gloss. These qualities should make it useful for floor polishes and cable insulation. Both waxes resulted from a 7-year research project at Sarnia, using an experimental plant which included a 600-bbl. per day Hydrofining unit. This hydrogen-treating unit was also used in developing the new lube oil plant now being built at Imperial's Edmonton, Alta., refinery.

The new Sarnia wax plant will include a wax recrystallization unit, a Hydrofiner, and continuous slabbing and packaging equipment. When completed in January 1957, it will supply about half of Canada's wax requirements.

Trans-Canada Signs Contract

WINNIPEG.—Trans-Canada Pipe Lines, Ltd., has taken another important step toward financing its big gas-transmission system from Alberta to Montreal.

The firm has signed a 20-year contract for sale of gas to Winnipeg & Central Gas Co. Gas from Alberta fields is scheduled to reach Winnipeg via the Trans-Canada line by the fall of 1956. Under the contract just signed, the Winnipeg utility will buy about 200 billion cubic feet of natural gas from Trans-Canada over the 20-year period.

N. E. Tanner, president of Trans-Canada, pointed out that the Winnipeg contract is the first to be acquired by his company for sale of gas in western Canada. The Winnipeg market is expected to be a great asset in getting money to finance the 2,200-mile cross-Canada line.

Until Alberta gas reaches here, Winnipeg & Central will continue to serve its market with alternative supplies of gas. The firm now sells coal gas and propane.

Canadian Briefs

OTTAWA. — A bill to incorporate Westspur Pipe Line Co. has been approved by the Commons Railway Committee. The company, sponsored by Imperial Oil, Ltd., proposes to build a pipeline system to carry crude from southern Manitoba and Saskatchewan to the Interprovincial pipeline between Edmonton and Sarnia, Ont.

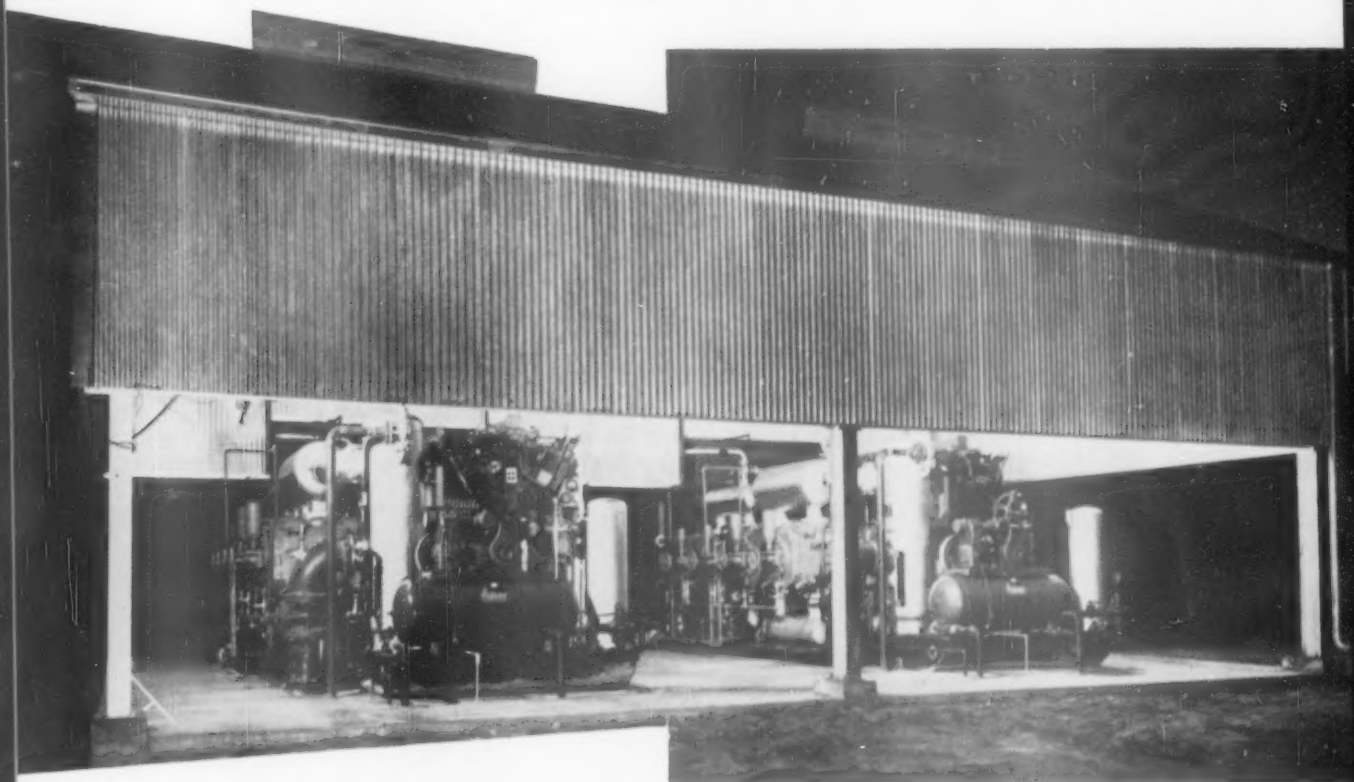
EDMONTON.—Ground and aerial surveys have started for the 106-mile crude line which will provide an outlet for fields in the Sturgeon Lake area to the Trans-Mountain line extending from Edmonton to Vancouver and Seattle. Canadian Gulf Pipe Line Co., Ltd., will operate the line. Construction will start this summer, and the line is scheduled to be in operation by year's end.

OTTAWA. — Stanmount Pipe Line Co. is seeking permission to construct a 180-mile crude pipeline from a point in North Dakota to Cromer, Man., to link with the Interprovincial pipeline. The line would cost about $6,000,000.

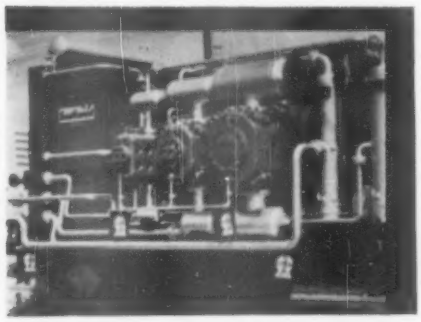
CALGARY. — Westcoast Transmission Co., Ltd., is seeking a 2-year extension of its permit to construct a natural-gas pipeline from the Peace River areas of Alberta and British Columbia to the U.S. Pacific Northwest. Delay in getting U. S. permission to move gas across the boundary was given as the reason for the application. The company also proposes to change the diameter of the line from 24 to 30 in. and to eliminate a line to the border at Osoyoos, B. C., serving the "Inland Empire" of the U. S. Northwest.

Southwest

PACKAGED COMPRESSOR PLANTS



Ohio Oil Company's packaged compressor plant, North Cotton Valley Field, Louisiana. Equipped with two Southwest — Cooper-Bessemer 500hp GMXAB, eight cylinder, two cycle, gas engine driven compressors.



A Modest Investment Means Flare Gas Can Be Sold

Gas which formerly had been wasted by flaring is now being sold and used for fuel. But making profitable use of waste does not require a capital outlay possible only by large companies. The **installed** cost of Southwest Packaged Compressor Plants is much lower than that of stationary units. They are within the range of any operator who wants to improve his operation. Packaged units with automatic control equipment for unattended operation offer further savings in labor costs. At the Ohio installation, one pumper on one shift takes care of maintenance and operation.

Estimated life of the wells in this field is from five to ten years. At that time the Southwest plant can be picked up and put down to work again in a new field. Be sure to look into **all** the economies of a Southwest Packaged Compressor Plant.

SOUTHWEST INDUSTRIES, INC.

Post Office Box 7773 Houston 7, Texas

GULF COAST

Offshore Bid Sets Record

Louisiana sale draws protest from Secretary of Interior after Humble offers $7,660,111 for tract in gulf

BATON ROUGE.—Louisiana last week got a whopping $7,660,111 bid for a 4,687-acre offshore tract at the mouth of the Mississippi River, and the federal Government immediately lodged a protest.

The bid is by far the largest ever offered to either a state or the federal Government for an offshore oil and gas lease. It was offered by Humble Oil & Refining Co. and amounts to $1,637 an acre.

Interior Secretary Douglas McKay wired the Louisiana Mineral Board protesting granting of the lease. He contends the record-breaking block lies in the disputed area which both Louisiana and the Government claim. Humble officials in Houston conceded that a small part of the block "could lie" outside 3 miles from Louisiana.

The Government says Louisiana's seaward jurisdiction ends at the 3-mile point. Louisiana contends it has control over the offshore lands at some points about 30 miles at sea *(The Oil and Gas Journal, August 2, 1954, page 54)*.

McKay's protest was telegraphed to the Louisiana mineral board. It read in part:

"Certain tracts offered in this sale are in apparent encroachment upon the line 3 miles distant from the 1950 administrative line of the Department of Interior . . ."

Bids high . . . Humble offered more than $7 million for two separate blocks in the sale. One was the disputed Block 31 in the South Pass area off Plaquemines Parish. The other was Block 20 in South Pass.

Humble offered Louisiana $7,340,000 for the entire 5,000 acres in Block 20. It adjoins Block 31 to the north.

The company also offered $1,700,111 for 4,045 acres in Block 16 in South Pass. It lies just to the northeast of Block 20.

It was in the South Pass area in February that the California Co. broke all previous records with a $6,572,000 bid for 4,687 acres *(The Oil and Gas Journal, February 28, page 88)*.

Although Humble's offer was the highest total ever bid on a tidelands tract, it fell far short of the per-acre record. This record is held by Magnolia Petroleum Co., which paid $2,209 an acre for a 1,440-acre tract in Block 52, High Island area, last November.

Second record . . . The total bids of $21,339,302 in cash bonuses offered for 25,376 acres at last week's sale shattered another record set in February for the highest single day of bidding in Louisiana's history. The previous record was $21,173,551.

In last week's sale Sun Oil Co. bid $285,420 for exploration rights on Marsh Island, a state game reserve off the Louisiana coast.

The Texas Co. bid $2,849,000 for 3,330 acres in South Pass Block 15, and Magnolia Petroleum Co. offered $1,629,500 for 4,994 acres in Main Pass Block 46.

Federal offer . . . In Washington, the Interior Department announced it will put 210 oil and gas leases in the outer Continental Shelf on the auction block July 12.

The sale may test Louisiana's claim to a 3-league boundary. A few of the tracts lie between 3 and 8 miles off the Louisiana coast.

The third shelf lease sale will include 170 tracts off Louisiana totaling 458,096 acres and 40 off Texas totaling 216,000 acres. Some of the tracts are as far as 60 miles from shore and in water 100 ft. deep. They range in size from 937 to 5,760 acres.

Most of the 594,666 acres nominated by the industry last March 25 will be offered for lease. Additional tracts were selected by a committee from the Geological Survey, Bureau of Land Management, and the Solicitor's Office.

Terms . . . Leases are being offered under the same terms adopted last year for the first sales. They will be given the bidder of the highest cash bonus, but no offer of less than $15 per acre will be considered. Oil payment, overriding royalty, logarithmic or sliding-scale bids will not be accepted.

"Mr. Gus" Gets His Footing Checked

Shell Oil Co.'s oceanographers are expert skin divers, but not in a sporting sense. Wearing porous rubber jackets as protection against the cold, L. E. Borgman and B. M. Krieger, Shell engineers, check their equipment before going down in 48 ft. of water off the Texas coast to check the gulf floor beneath the big mobile drilling platform, "Mr. Gus." The divers observe and measure currents, soil conditions, corrosion, sand abrasion, and other factors which affect the location and operation of offshore drilling rigs.

SOUTHWEST INDUSTRIES, INC.
Post Office Box 7773 Houston 7, Texas

All bids must be for the full tract offered. Leases will provide for a royalty of one-sixth and a rental or minimum royalty of $3 per acre or fraction.

In view of the confusion that arose last year, the department warned that the tract numbers on which bids are to be offered are for identification only. They do not describe the tract itself, which is shown by the block number.

At the sale last October, Kerr-McGee Oil Industries, Inc., mistook the tract numbers for the block numbers on 12 tracts, on most of which it was the high bidder. The company's bids later were canceled by the department because of the mistake.

The first shelf bids were opened in Washington. Since then, the department has set up an office at New Orleans from which all shelf activities will be supervised.

Louisiana showdown? . . . Department officials declined to say why they were offering tracts within the 3-league boundary claimed by Louisiana. But the Justice Department has been studying the matter for some months and is reported about ready to announce whether the federal Government will recognize that claim.

Louisiana's claimed boundary runs out to about 30 miles into the Gulf of Mexico at some points. Last September, when the Interior Department asked for bids on leases off the Louisiana coast, the state arranged a sale for the same date as the federal opening and offered 88 tracts which the department also had listed.

Following conferences between federal and state officials in Washington, the state called off its sale and the department withdrew approximately nine blocks between 3 miles and 3 leagues from Louisiana's mean low-water mark.

The leases to be sold in July bring the total area marked out by the department for development to about 1,200,000 acres. The Bureau of Land Management estimates the potential leasable area on the Continental Shelf at 20,000,000 acres. Approximately 500,000 acres was leased last year, 25,000 of it for sulfur development. The Government received $140,970,000 in bonuses and already has collected $1,435,625 in rentals.

Offshore Pays Hit

Three producers found in gulf off Louisiana

NEW ORLEANS. — Louisiana's rapidly expanding tidelands exploration resulted in the opening of three new fields last week. Two are in the Gulf of Mexico off the Mississippi River delta of southeastern Plaquemines Parish. The other is off the eastern coast of St. Bernard Parish in Breton Sound.

At the southeast tip of Plaquemines Parish, in Block 5, South Pass area, The California Co. completed its 1 State Lease 2589 as an oil-discovery well. Initial potential through a 9/64-in. choke was at the rate of 181 bbl. per day with gas-oil ratio of 503 cu. ft. per barrel and pressure of 900 psi. Gravity of the oil is 32°. Production is from Miocene sand, perforated at 9,077-90 ft.

The well is about 2 miles north of Shell Oil Co.'s Block 6 field, opened in January with oil production from an 8,300-ft. sand.

Conoco discovery . . . West of the Southwest Pass tip of the delta, in Block 56, West Delta area, Continental Oil Co. made a small gas-condensate discovery well in a 4,360-ft. Miocene sand in its 1 State Lease 2550. Hole is plugged back to 4,373 ft. from total depth of 12,898 ft., to which it was drilled without additional showings. Well flowed at rate of 666,000 cu. ft. of gas with 1.7 bbl. of condensate daily through 9/64-in. choke, recording pressure of 1,710 psi. Pay is perforated at 4,361-65 ft.

Its location is about 6 miles from nearest land of any description. It is the fifth field Continental has discovered in the general area within the past 2 years. It is more than 3 miles from the nearest production.

The third new tidelands discovery, located in Block 1, in the northwestern corner of Breton Sound, was by Republic Natural Gas Co. Its discovery well, on State Lease 2464, was rated good for 20 bbl. of 41.3°-gravity condensate per day through ¼-in. choke with gas at the rate of more than 15,000 cu. ft. per barrel of fluid. Flowing pressure was 2,600 psi. Production is from sand interval at 7,421-23 ft.

The discovery is about 2 miles south of The Texas Co.'s Block 69 gas-discovery well in Chandeleur Sound area and about 7 miles southeast of Phillips Petroleum Co.'s Eloi Bay oil and gas field, also in Chandeleur Sound area.

ROCKY MOUNTAIN

Rangely Gas Freed

Colorado Supreme Court kills injection order; producers no longer forced to return natural gas to oil formation

DENVER.—Producers are no longer required to return natural gas to the formations in rich Rangely field, which produces almost half of Colorado's oil.

The state Supreme Court has killed a June 20, 1952, order of the State Oil and Gas Conservation Commission requiring the injection. The court declared the commission's order oversteps the authority granted it by the Colorado Legislature. The Supreme Court handed down its ruling after hearing an appeal of a Denver District Court decision upholding the injection.

Plaintiffs in the action were The Texas Co., Union Pacific Railroad, and Sharples Oil Co. Supporting the commission in the case were the state oil inspector, Phillips Petroleum Co., The California Co., and Stanolind Oil & Gas Co.

Gas flared . . . The order required that after January 1, 1953, no natural gas could be produced from the Weber sand reservoir of the Rangely field unless the gas so produced was returned to the reservoir. The only exception was gas required for development and domestic needs in the immediate area of the field.

Rangely is Colorado's largest oil-producing field. It covers about 20,000 acres. The field has 478 producing wells with a daily production of 66,500 bbl. This is little less than half the state's present average production of 140,000 bbl. daily.

The wells produced about 39 million cubic feet of gas daily, of which 20 million cubic feet were being flared.

The announced purpose of the gas re-injection program order by the commission was to prevent dissipation of energy inherent in the gas as the force necessary to production of oil.

Up to legislature . . . The Supreme Court opinion stated, in part:

"We recognize there may be great advantages to the operators and substantial additional recovery of oil in the Rangely field if repressuring secondary recovery mechanisms are adopted.

"We also appreciate the fact that substantial benefits may accrue to op-

erators in the field and to the state if unitization of Rangely field were to be accomplished. Either or both of these objectives might be had by voluntary agreements between the operators.

"A valid compulsory program to accomplish those ends must have definite authorization from the legislature."

The court estimated 1,162,000,000 bbl. of oil would be left in the Weber sand when the field no longer can get oil with primary methods.

The discovery well hit the Weber formation at 5,955 ft. It was the 1 Raven drilled in 1933. However, there was no production until 1943-44 when World War II raised oil prices and stimulated other drilling in the field.

New Leasing Delays

Montana board asks more data on its oil lands

HELENA, Mont. — The Montana Land Board again has refused to set a date for immediate leasing of state-owned oil and gas lands under the 1953 indefinite-term law.

Instead, the board has decided to compile data on the location of prospective leases and their relation to known structures and producing acreage.

There have been repeated delays in state oil land leasing for 2 years due to litigation of the 1953 act. Leasing recently was ordered resumed and 70 applications received after the United States Supreme Court reversed a Montana Supreme Court decision holding the law unconstitutional.

A new controversy cropped up at the board's May meeting, giving indications there may be a court test of a 1951 law. It established ceilings on the royalty percentage the state may take on production.

This law sets royalty on all gas production at a flat 12½ per cent and the same amount on the first 3,000 bbl. of oil from any well. Under a new procedure adopted by a majority of the board, however, a minimum royalty of 16⅔ per cent would be demanded for any lease within the limits of a producing structure, or for any tract sufficiently close to a producing well or so situated as to indicate that the oil pool also underlies state land. Leases for purely wildcat tracts would be offered at a royalty of 12½ per cent.

James Haughey of Billings, legislative spokesman for the Rocky Mountain Oil and Gas Association, told the board "you are asking for a lawsuit."

Oil men attending the meeting, pointing to the order for cataloging of the state's potential oil lands, said they considered it unlikely that a lease auction could be held much before the last week in June.

Two Oil Taxes Studied

LINCOLN, Neb. — The Nebraska Legislature is considering two new taxes against the state's oil industry.

One bill would place a 2 per cent tax on all gas and oil produced in the state. The other calls for a tax on oil leases and other documents relating to mineral rights. Three cents an acre would be charged for areas covered in agreements of less than 10 years' duration. The rate would increase to 6 cents an acre on leases running 10 to 20 years, and to 8 cents for more than 20 years. The revenue would go to the state school fund.

New Montana Play

Two tests drilling, third planned in Disturbed Belt

CUT BANK, Mont.—Exploratory activity is picking up in the Disturbed Belt area of northwestern Montana. It is a narrow finger of land lying between the Sweetgrass Arch and the Mountain Front and has been rated a good possible new oil frontier.

Continental Oil Co. will drill the third wildcat scheduled for the belt this spring. Conoco plans an 8,500-ft. Madison-Mississippian wildcat in the Milk River area of Glacier County just east of the Rocky Mountains.

The well will be 1 Tribal located on Blackfoot Indian Reservation acreage. The land was leased by Conoco at a sealed bid sale in 1954. The bonus was $179.77 an acre. The test will be drilled 4½ miles northeast of a dry hole taken to 10,102 ft. in 1946, the only deep test ever drilled on the United States side of the Disturbed Belt.

The northwestern Montana area has been the scene of active leasing for 2 years. Considerable seismic work also has been completed over the area during the same time.

Two other wildcats are now being drilled along the belt. Union Oil Co. is below 8,400 ft. at 1 Morning Gun in Glacier Park area, 20 miles south of the Conoco wildcat. Carl Yandt is drilling at 5,490 ft. at his Melford Colony test in Lewis and Clark County. Both tests will go to the Madison. It is reported several wildcats will test this potential oil province this year. There is no present production in the belt.

Shawano, Garnak May Merge

DENVER.—Garnak Drilling Co., Denver, and Shawano Development Corp., Palm Beach, Fla., will be merged if stockholders approve the plan June 3.

Merger terms provide that Shawano will acquire Garnak's 63 producing wells and 50,000 acres of leases in Kansas and the Rocky Mountain states. Garnak shareholders would receive about $6,000,000 in securities.

Shawano will set up an oil development and operations division to take over the activities formerly handled by the Garnak organization. Shawano was organized 4 years ago. In addition to the drilling company, it owns U. S. Mercury Corp., Paul Revere Uranium Corp., the Isle de Capri Hotel in Miami Beach, and several other uranium properties.

Casper Plans Oil Show

CASPER, Wyo.—Planning for the first Rocky Mountain Oil Show, scheduled here June 23-26, is in its final stages.

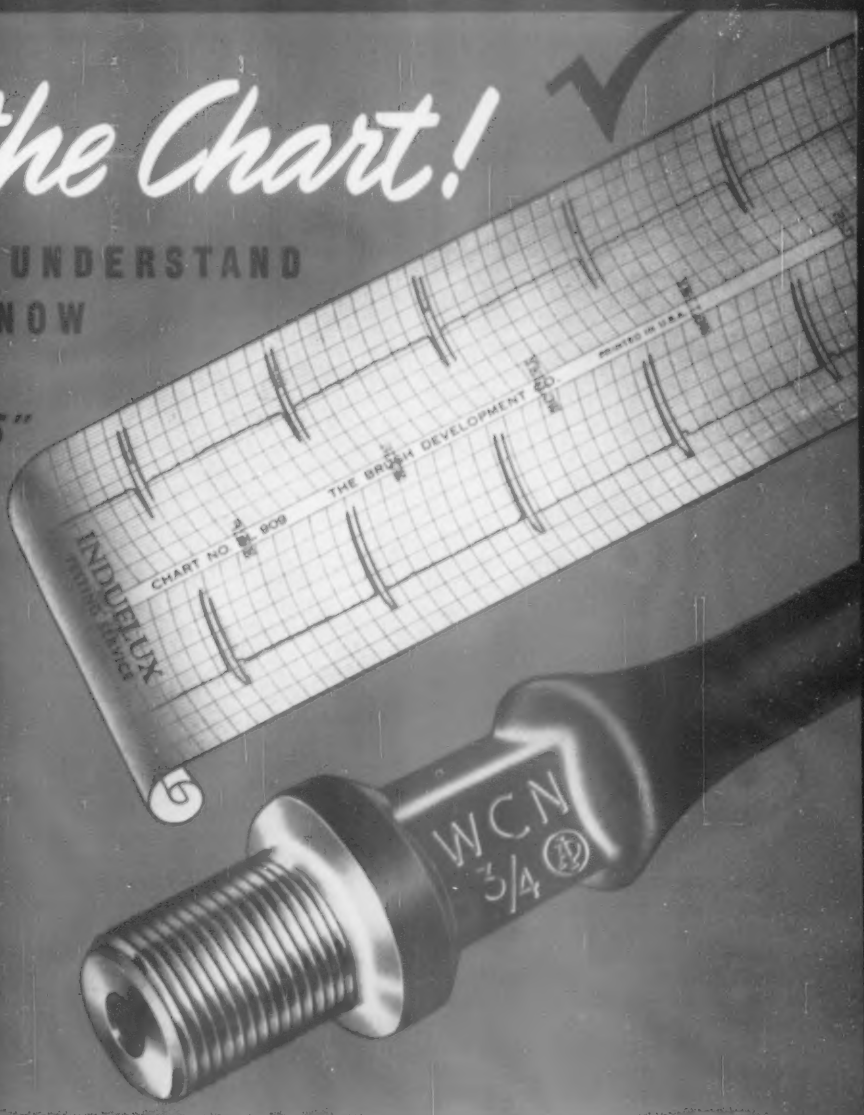
The show, the first of its kind ever sponsored in the Rockies, will be patterned after the Permian basin show in Odessa, Tex. The idea for a Rocky Mountain oil show took root 2 years ago among a delegation of Wyoming oil men who went to Tulsa to take part in "Wyoming Day" at the International Oil Exposition in May 1953.

The idea was brought up again last summer, and the Oil Council of the Casper Chamber of Commerce accepted the responsibility of sponsoring and planning for the show.

Check the Chart!

. . . AND YOU'LL UNDERSTAND WHY MEN WHO KNOW SUCKER RODS *"SPECIFY NORRIS"*

Years of experience have proved the dependable high quality, long lasting characteristics of Norris Sucker Rods. Now Science, through comprehensive tests, shows why the name Norris is synonymous with the best.



Your SUPPLY STORE IS OUR DISTRIBUTOR

LET'S LOOK AT THE RECORD

Modern, non-destructive, electronic tests — as the one illustrated above — show the homogeneous, flaw-free, metallurgical structure of Norris Sucker Rods — the result of EXPERT HEAT TREATING.

In the Norris Plant, each step in heat treatment is precision controlled to insure uniform grain structure — to insure toughness and strength to Norris Sucker Rods.

Correct metallurgical techniques — careful visual inspection — result in Norris Quality Sucker Rods—Proved by tests—Proved in service—SOLD THROUGH YOUR FAVORITE SUPPLY STORE.

W.C. NORRIS MANUFACTURER, INC.

TULSA, OKLAHOMA

WEST COAST DISTRIBUTOR:
REPUBLIC SUPPLY COMPANY OF CALIFORNIA
Los Angeles

Since QUALITY PRODUCTS 1882

BRANCHES:
GREAT BEND, KANSAS; HOUSTON, KILGORE, ODESSA, WICHITA FALLS, TEXAS; SALEM, ILLINOIS; CASPER, WYOMING; OKLAHOMA CITY, OKLAHOMA
EXPORT: 30 ROCKEFELLER PLAZA, NEW YORK CITY

Sicilian Field Expands

Gulf subsidiary has fourth producer in Ragusa area; concessions on Italian mainland may be decided soon

AMERICAN INTERNATIONAL FUEL & PETROLEUM CO., a subsidiary of Gulf Oil Corp., has brought a fourth well into production in its Ragusa field in southwestern Sicily.

The new producer has increased daily production from the field to about 450 tons. Considering the gravity of around 20° A.P.I., this is equivalent to about 3,000 bbl. daily.

The No. 5 well has been successfully tested from about 2,000 m., or about 6,550 ft. When it is connected, the field's output is expected to be raised to about 600 tons, or around 4,000 bbl. daily. Two more wells are being drilled at locations which, if they are successful, will show a field length of 5 km., or about 3 miles.

More wells proposed . . . Plans call for 15 more wells to be drilled at Ragusa before the end of 1956. On the basis of per-well production thus far, these additional wells, if successful, would build the field's output up to nearly 18,000 bbl. daily.

A new rail line is being built from Ragusa to the field's tankage. When this is completed, a total of 30 tank cars of crude daily will be sent to the Augusta refinery of the Italian RASIOM company. At present, about 16 tank cars daily are leaving Ragusa for Augusta.

Mainland stalemated . . . On the Italian mainland, the Petrosud company, owned jointly by Gulf and the Italian Montecatini Mining & Chemical Co., is still waiting action of the Italian Government on an exploitation concession, or producing lease, for its field discovery at Alanno near Pescara across the peninsula from Rome.

Petrosud has asked exploitation rights over a 25,000-acre area around its Cigno discovery of last February. Considerable importance is attached to the government's action on the Petrosud application as it will be a concrete indication of government policy toward foreign oil capital.

The acreage on which the Cigno discovery was made was acquired by Gulf, but a half interest was disposed of to Montecatini which handled operations through the Dutch drilling subsidiary of Drilling & Exploration Co., Inc. Other foreign companies have held back from entering Italy because of defects in the 28-year-old Italian mining law, which gives no guarantee of exploitation rights after a discovery is made.

Concession rules . . . The Italian Council of Mines met recently in Rome and laid down general rules for the granting of oil concessions. It decided that permit areas could be renewed for 2 years but with a 25 per cent reduction in area if the permit is for more than 60,000 hectares (148,000 acres). If the area covers more than 100,000 hectares after the reduction, it will be subdivided into not more than 50,000 hectares (123,500 acres).

In renewing permits the council will seek to avoid giving too extensive an area to a single person or company or to companies under one control. In production concessions, the royalty to the state will be fixed by the Ministry of Industry in each case.

The council was scheduled to begin examination of pending applications for concessions the latter part of May. The Petrosud application presumably will be acted on at that time.

The company has drilled a second well in the Cigno area. Production is being held up pending action on the exploitation concession. The discovery tested about 2,000 bbl. daily of 34°-gravity crude.

SASOL Gasoline Priced Low

Gasoline from the coal-to-oil synthesis plant of South African Coal, Oil & Gas Corp., Ltd., will be sold for about 1 cent a gallon less than imported gasoline when it goes on the market.

Gasoline is scheduled to be produced this month and marketed in July. The synthesis plant is expected to produce 5,550 bbl. daily of oil products. It was financed by the government and built at a cost of about $92,000,000. The plant is located at Coalbrook, 50 miles south of Johannesburg.

Whether pricing of gasoline below imported fuel was based on production costs or on the need to find customers was not disclosed. Output of the SASOL plant will meet only a fraction of the union's demand for gasoline. Construction of the coal-to-oil plant was believed economically justified only because of the high cost of transporting petroleum products from the coast to the interior on the government-owned railroad.

Estimates are that a pipeline could carry gasoline from the coast at a fraction of the present cost, which is the equivalent of about 9.4 cents a gallon.

I.P.C. Plans Line

Pipeline from Syria would run to Mediterranean port

IRAQ PETROLEUM CO., LTD., is making plans to lay a 24-in. line from near Homs, Syria, to Tripoli, Lebanon, as part of an expansion of its eastern Mediterranean system.

The 75-mile line to the Tripoli export terminal would carry about 180,000 bbl. daily. It would handle additional crude made available to Homs by two additional pump stations on the existing 30 and 32-in. trunk.

I.P.C.'s present system runs from Kirkuk field in Iraq with a connection to the smaller Mosul Petroleum Co., Ltd., producing area in northern Iraq. It consists of twin 12 and 16-in. lines as well as the 30-32-in. line built several years ago. Elevation rises from about 600 ft. on the Euphrates River to about 2,500 ft. east of Homs.

One set of 12 and 16-in. lines lead to Tripoli where I.P.C. has export facilities as well as a refinery of 11,550 bbl. daily capacity. The other 12-in. and the second partially finished 16-in. extends to the Haifa refinery in Israel. It has been out of service since the Israeli-Arab war in 1948. The 30 and 32-in. line moves crude to the Banias, Syria, terminal farther north of Tripoli.

The 30 and 32-in. line was completed with four pump stations *(The Oil and Gas Journal, April 4, page 118)*. Bringing this line on a six-station basis would deliver considerable additional crude which would thus be moved to Tripoli through the new 24-in. At present, the 30 and 32-in. carries about 370,000 bbl. daily. Another flow of approximately 160,000 bbl. daily is delivered to Tripoli through the 12 and 16-in.

I.P.C. has been studying a project to provide still more pipeline capacity to the Eastern Mediterranean by diverting the unused Haifa branch north to a new export point in southern Lebanon. To accomplish this, a line would be laid from a point east of the Israeli border northwest through Syria and Lebanon.

Bayamon On Stream

Puerto Rico opens first refinery, a 10,500-bbl. plant built at cost of $12 million; another going up at Guayanilla Bay

PUERTO Rico's first refinery—a 10,500-bbl. daily plant—has gone on stream at Bayamon, near San Juan. The plant was built by Caribbean Refining Co. at a cost of $12,000,000.

Owners of the new company are Gulf Oil Corp.; J. H. Whitney & Co., New York investment bankers; Pontiac Refining Co.; Cosden Petroleum Corp.; Ferre Industries, Puerto Rico; Emby Kaye, Tulsa consultant; and Byllesby & Co., New York underwriting firm. The president is Edwin Singer, president of Pontiac Refining.

The plant was built by Fluor Corp., and process units were designed by Universal Oil Products Co. Facilities include a 6,800-bbl. daily vacuum unit, a 5,000-bbl. daily fluid catalytic cracking unit, a 500-bbl. daily catalytic polymerization unit, gas-concentration and vapor-recovery units, a liquefied petroleum gas unit, and various treating facilities. Electric desalting equipment treats crude before processing.

Crude from Eastern Venezuela will be brought by tanker to new docks about 2¼ miles northeast of the refinery, around the bay from San Juan. A 2-mile pipeline transports the crude to the plant.

Major products will be gasoline and fuel oil. All other normal refinery products will be made. Most of the products will be marketed in the San Juan area. The climate in Puerto Rico eliminates need for domestic fuel oil and creates a compartively level demand for gasoline the year round.

A refinery had been planned about 4 years ago but was delayed by negotiations for a long-term sales contract covering bulk of the fuel oil.

A second refinery, a 23,500-bbl. plant of Commonwealth Oil Refining Co., Inc., is expected to go on stream late this year at Guayanilla Bay, on the southern coast of Puerto Rico. This plant will cost about $24,000,000, completely financed by private United States funds.

At least two new petrochemical plants reportedly will be built as soon as the refineries are in operation. One plant will produce ammonia and the other insecticides.

Refinery for Finland

Lummus given contract for world's northernmost plant

THE world's northernmost refinery will be built near Taku, Finland, at a cost of $17,000,000.

Contract for the 18,000-bbl. daily plant has been awarded to the Lummus Co. The firm of Neste O/Y, a Finnish oil storage company in which the government holds majority interest, announced the contract award. It said the plant will be designed to handle crude oils from the Middle East and the Black Sea areas.

The Finnish parliament authorized the government to guarantee payment of the necessary foreign loans for construction. French and German interests reportedly financed the project.

The plant will meet most of Finland's present domestic requirements which total about 20,000 bbl. daily. It will be the only petroleum processing facility in the country.

Contract with Lummus provides for the firm to furnish detailed engineering, purchasing assistance, construction supervision, and aid during initial operation. Engineering is to be carried out by Lummus in New York and by the firm's subsidiaries in The Hague, London, and Paris.

Distribution of refined products is expected to be handled mainly through existing distribution companies in Finland, but final agreements are yet to be reached. The Finnish Government has denied attempting to monopolize its domestic oil industry.

The proportion of crude to be supplied from Russia and Romania, and the amount, if any, to come from western sources in the Middle East was not learned. Until 1952, virtually all of Finland's oil needs were supplied by three western companies: Standard Oil Co. (N. J.), Royal Dutch-Shell, and Gulf. Because of currency shortages, the country began importing oil supplies from Russia in increasing amounts.

Under recent trade agreements, Russia will supply 80 per cent of Finland's requirements for 5 years. Romania has a 1-year agreement to supply 20 per cent. The Soviets have offered to supply all the crude for the new refinery.

Unit Added in Canary Islands

This 5,000-bbl. per stream day Universal Oil Products Co. Platforming unit is now in operation at the 40,000-bbl. daily refinery of Cia. Espanola de Petroleos at Tenerife, Canary Islands. Integrated with a Udex unit, the Platformer runs on a blocked-out operation to produce alternately high-purity benzene and toluene and motor-fuel blending material

Sinai Output Rising

International Egyptian near its 10,000-bbl. daily goal

INTERNATIONAL EGYPTIAN OIL CO., INC., appears near its 1955 production goal of 10,000 bbl. daily from Feiran and Balayim fields.

Data from the nine wells already drilled in the company's concessions in southern Sinai Peninsula confirm a previous appraisal of the field discoveries. The statistics were released by Southern California Petroleum Corp., a 10 per cent American partner in International Egyptian.

A new oil-bearing zone has been discovered in the Belayim No. 3 well at a depth of from 6,940 to 7,020 ft.

Coring is continuing to determine the complete thickness of the zone. A drill-stem test indicated a production potential of about 1,000 bbl. daily.

Belayim 3 is about 1,320 ft. north and slightly east from Belayim 1, which has a potential of about 2,000 bbl. daily from about 7,350 ft. The No. 2 well, located about 1,320 ft. north and slightly west of Belayim 1, tested about 1,900 bbl. daily of 23° plus gravity crude from 5,104-70 ft.

Belayim field is similar to Ras Gharib field, located on the western shore of the Gulf of Suez, where seven oil-bearing zones have been developed, Southern California said.

In Feiran field, the No. 4 well has reached a 100-ft. thick oil-bearing section. The well is capable of producing from 800 to 900 bbl. daily. The field's No. 1 well at present is producing 80 bbl. daily and the No. 2 well, 700 bbl. daily. Feiran No. 3 has been definitely abandoned. The Sidri No. 1 and 1-A wells and Baba No. 2 have been suspended temporarily for technical reasons.

International Egyptian exploration program calls for employment of two seismic land crews and one seismic marine crew. The drilling program for 1955 provides for at least 15 new wells.

Lake Plant Planned

Creole proposes second big injection unit on Maracaibo

CREOLE PETROLEUM CORP. plans to build its second gas-conservation plant on Lake Maracaibo in Western Venezuela. The new plant will be almost twice as large as the present plant.

The proposed plant will inject about 300 million cubic feet of natural gas daily into oil-bearing formations under the lake. It will be located about 6 miles from the Tia Juana injection unit opened earlier this year *(The Oil and Gas Journal, January 17, page 57)*. It will cost $32 million. Work will start after approval by the Venezuelan Government.

Construction plans call for building a 430 by 130-ft. platform on 196-ft. piles sunk 75 ft. into the lake. The compressor plant will be powered by gas turbines with a total rating of 96,000 hp.

When the second plant is completed, Creole will be gathering 475,000,000 cu. ft. daily from producing wells in the Bolivar Coastal field and reinjecting it into formations to increase oil recovery. Major Bolivar Coastal field pools have no active water drive at the bottom and originally had no gas cap at the top.

The first injection plant was built at a cost of $24 million. It injects about 137,000,000 cu. ft. of gas daily. Its capacity is expected to rise to 175,000,000 cu. ft. daily with about 17,000,000 cu. ft. daily of gas being used as fuel and other purposes.

Tests Planned in Haiti

An American independent, Commonwealth Oil Co., of Miami, Fla., is planning four oil tests in Haiti, where it holds a 50-year concession covering the entire republic.

The company has arranged with N. E. Andrews, a Houston independent operator, to drill the wells. The first test, expected to be spudded by June 1, will be on the western end of Isle de la Gonave. This island, 35 miles by 9 miles, is off the western coast of Hispaniola, a major Caribbean island southeast of Cuba. Haiti covers the western half of Hispaniola, and Dominican Republic the eastern half.

Austria Regains Oil—At a Price

AUSTRIA has regained its war-captured oil fields. But the price came high.

The Austrian state treaty signed early last week in Vienna requires Austria to deliver nearly 70,000,000 bbl. of crude to Russia in the next 10 years and pledge not to transfer its oil properties to foreign ownership later.

Text of the treaty signed by the foreign ministers of Russia, Great Britain, and France and U. S. Secretary of State Dulles gives most of the Austrian oil industry—exploration concessions, producing fields, refineries, and marketing properties—to Russia.

Their return to Austria is accomplished under terms of a separate Austrian-Russian agreement negotiated early in April in Moscow. This agreement, forming the basis of the four-power state treaty, provides for return of the properties to Austria in exchange for the delivery to Russia of 1,000,000 tons a year, or about 20,000 bbl. daily, of Austrian crude.

Paragraph 13, Article 22 of the treaty itself reads that "Austria further undertakes not to pass to foreign ownership" the rights and properties to be transferred to Austria by the Soviet Union under terms of the Austro-Soviet memorandum of April 15. The treaty text itself sets out the oil properties in four separate lists, one each for exploration concessions, fields, refineries, and marketing properties. These are acknowledged to be German assets which the four powers have the right to dispose of under the 1945 Potsdam accord.

Producing fields were listed as: Muhlberg; St. Ulrich-DEA; St. Ulrich-Niederdonau; Gosting-Kreutzfeld-Plondier (50 per cent of production). The exploration areas number 26 separate concessions totaling 766,340 hectares, or nearly 1,900,000 acres. The producing fields were stated to be equivalent to 60 per cent of Austrian oil output for 1947. The exploration concessions represented 60 per cent of the areas in Eastern Austria that are German assets.

Refineries listed in the treaty were shown as having an annual productive capacity in 1947 of 420,000 tons, or about 8,000 bbl. daily. The five plants were: Lobau, 240,000 tons annually; Nova, 120,000 tons; Korneuburg, 60,000 tons; Okeros (re-refining); and Moosbierbaum (excluding equipment belonging to France and subject to restitution), no capacity given.

International Briefs

The board of directors of Creole Petroleum Corp. has authorized a three-for-one split of its capital stock to shareholders of record as of May 20, 1955. The effect of issuing two shares of $5 par value for each share of the same amount is to increase the capital stock to $387,979,650.

The Texas Co. has contracted for two 28,000-ton tankers to be built in Belfast, Ireland, by the firm Harland & Wolff.

The first Hydrofiner has gone on stream at British Petroleum Co., Ltd.'s, 70,000-bbl. daily capacity refinery at Kwinana, Western Australia. At present, the Hydrofiner is the only one in operation at refineries of the BP group. Similar units are to be built at the group's refineries at Kent, England, and Hamburg, Germany.

Petroleos Mexicanos has brought in the first well in the new Tres Higueras oil field, 25 miles from Vera Cruz. Gage was not given, but Mexican sources reported the well was yielding 500 bbl. daily. Production started at 1,700 ft.

Sinclair Oil Corp. has increased its ownership in Venezuela Petroleum Co. from 86.5 per cent to 96.2 per cent by acquiring 390,057 shares of common stock in a recent exchange offer.

The *Beeline* Way to Better Production

BETHLEHEM SUPPLY COMPANY

General Offices: 21 E. Second St., Tulsa, Okla.

There are easier jobs than choosing a bottom-hole pump, but we've done our level best to make it simple. How? By offering pumps with *all* the features — every last one — that production men demand. These are the Bethlehem Beeline models, the bottom-hole pumps for every type of installation.

Here are just a few of the points that demonstrate their sound engineering:

Hardened cast-iron liners, chrome-plated plungers, double valves, armored cages, Superloy balls and seats; Simplex, three-cup, or API hold-downs; Reed and tap-type standing valve pullers. Optional features include Endurall balls and seats, hardened barrel tubes, chromium-plated barrel tubes, Reliance sectional plungers, and Endurall cages and fittings for very corrosive conditions.

Beeline sectional-liner, rod full-barrel, and three-tube pumps can be made up quickly in any length desired. They are expertly serviced in the field by Bethlehem's many pump shops, which are located in all the major production centers. At each of these well-equipped shops, a full stock of parts as well as mechanical service is always available.

Check with our nearest office or store for information. We'll be glad to give you complete details of Beeline pumps, and of Bethlehem pumping units and sucker rods.

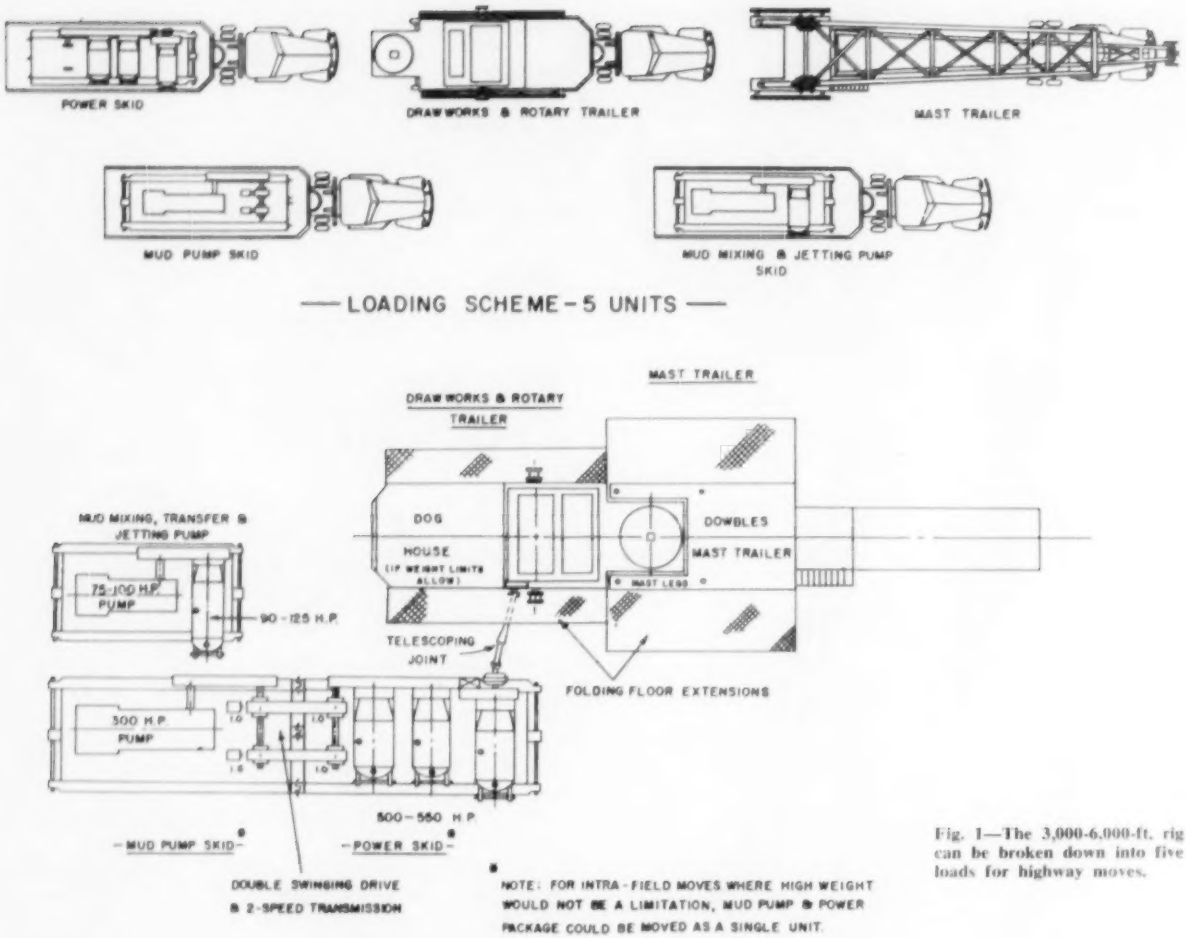

POWER SKID
DRAWWORKS & ROTARY TRAILER
MAST TRAILER
MUD PUMP SKID
MUD MIXING & JETTING PUMP SKID
— LOADING SCHEME – 5 UNITS —
MAST TRAILER
DRAW WORKS & ROTARY TRAILER
MUD MIXING, TRANSFER & JETTING PUMP
75-100 H.P. PUMP
90-125 H.P.
DOG HOUSE (IF WEIGHT LIMITS ALLOW)
DOUBLES
MAST TRAILER
MAST LEGS
TELESCOPING JOINT
FOLDING FLOOR EXTENSIONS
500 H.P. PUMP
500-550 H.P.
MUD PUMP SKID
POWER SKID
DOUBLE SWINGING DRIVE & 2-SPEED TRANSMISSION
NOTE: FOR INTRA-FIELD MOVES WHERE HIGH WEIGHT WOULD NOT BE A LIMITATION, MUD PUMP & POWER PACKAGE COULD BE MOVED AS A SINGLE UNIT.

Fig. 1—The 3,000-6,000-ft. rig can be broken down into five loads for highway moves.

What's Ahead in Rig Design?

Part 1

This is the first of two articles by R. L. Walker on trends and thoughts in drilling-rig design. In this article the author discusses three basic rig designs that feature flexibility, balance, and portability. In the second article he will answer several pertinent questions regarding these rig designs. These answers are based upon industry experience insofar as possible.

by R. L. Walker

PROPER design of drilling rigs at no greater cost can give the contractor a unit that he can move with less expense and that will have horsepower available when and where needed.

The split-compound rig and the dual trailer rig have had major influence on current industry design and thinking during the past 4 years. The thinking and past experience with these types of rigs and recent experience in slush pump operation have served as a guide in designing three basic sizes of rigs. The types set forth for consideration and possible future use are:

1. Portable drilling rig, 3,000-6,000-ft. class.
2. Portable drilling rig, 6,000-12,000-ft. class.
3. Unitized heavy-duty drilling rig, 12,000-20,000-ft. class.

This paper was originally presented before the spring meeting of the Rocky Mountain district, Division of Production, American Petroleum Institute, Casper, Wyo., under the title, "Trends and Thoughts in Drilling-Rig Design." The author is with Shell Oil Co., Denver.

Portable Drilling Rig, 3,000-6,000-Ft. Class

This dual trailer unit features a 94 or 97-ft. mechanically telescoping mast as the principal component of one trailer and the draw works and rotary table as the primary equipment of the second trailer (Fig. 1).

By so dividing the hoisting and rotating machinery and placing the power

plant on the ground as an extension of the pump skid, good weight distribution and compact packaging of portable, roadable, permit load, units are achieved.

Fast rig-up should be the outgrowth of such planning, for assembly following a field move consists essentially of buttoning the two trailers together; spotting the pump-power package; connecting the telescoping universal-jointed power transmission shaft; and extending and raising the mast after tying the loose end of the wire line into the drum.

Flexibility is designed into the rig through utilization of the same power plant for pumping, hoisting, and rotating. (Note power flow diagram, Fig. 2.)

A two-speed drive (or torque converters on engines if properly selected and ratioed) adds further flexibility to the rig, if desired, by providing in the low-speed ratio a low volume-high pressure pump operation for such well work as breaking down perforations, squeezing or fracturing, drilling in with a small drill string, breaking circulation on reopened wells, and operating hydraulic fishing or pulling tools.

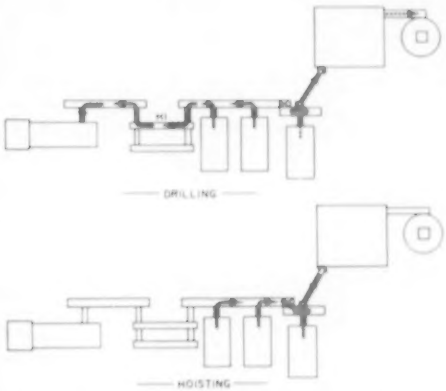


Fig. 2—Power flow diagram shows how the same power plant is used for pumping, hoisting, and rotating.

Better road portability in the form of further division of heavy loads is also achieved with the pinned connections between skids and the mud pump-power package and the swinging feature of the two-speed drive (swinging single-speed drive if torque converters are used on engines). This enables movement of this equipment as one package in the field or as two packages on the highway.

Table I presents data on wells drilled recently for a major company as a part of a slim-hole exploration program. Inasmuch as the wells were drilled on day work, excellent records

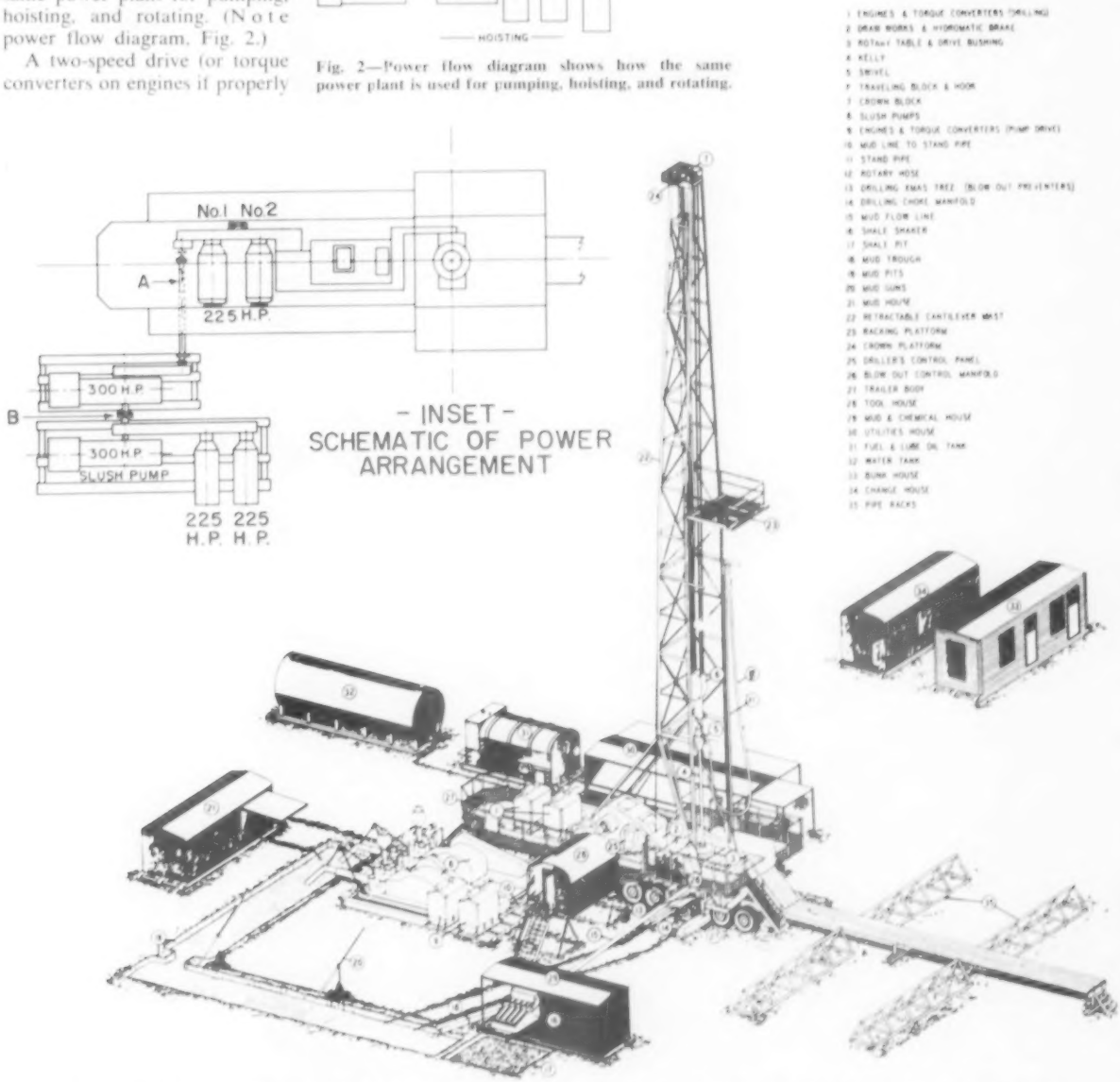


Fig. 3—This type of medium-class rig is used in Southwest Texas and can move and spud in less than 6 hours on field wells.

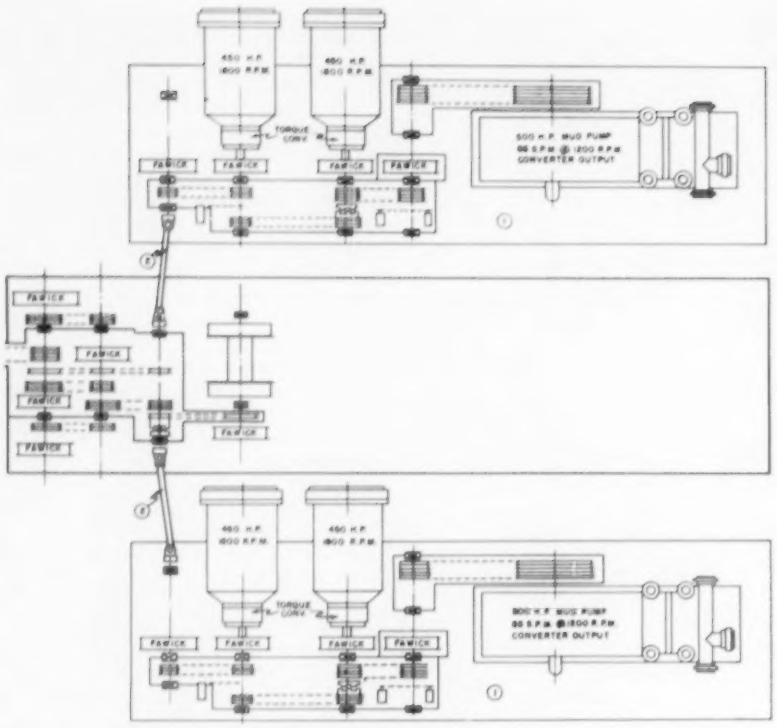


Fig. 4—This split compound rig (above) has been used in California for several years.

on drilling, moving, and rigging time were kept.

These drilling programs which involved moves of 5 miles or less were both conducted with trailer-mounted units which, in each case, carried the draw works, telescoping mast, and drilling engine or engines. Conventional substructure, and an independent pump-power unit were used with both rigs. Weather influences, terrain, quality of contract truckers, and other uncontrollable factors affected, of course, the time required for moving, rigging up, and down. However, even with present portable units it was interesting to note that on short moves, 12 to 18 per cent of the total time per well was consumed in moving, assembly, and disassembly of the rig. A reduction of this time multiplied by the three to four times the operation is repeated per month, if the operator is fortunate enough to have continuous work, gives an idea of the relative economic value of increased portability in rigs of this size.

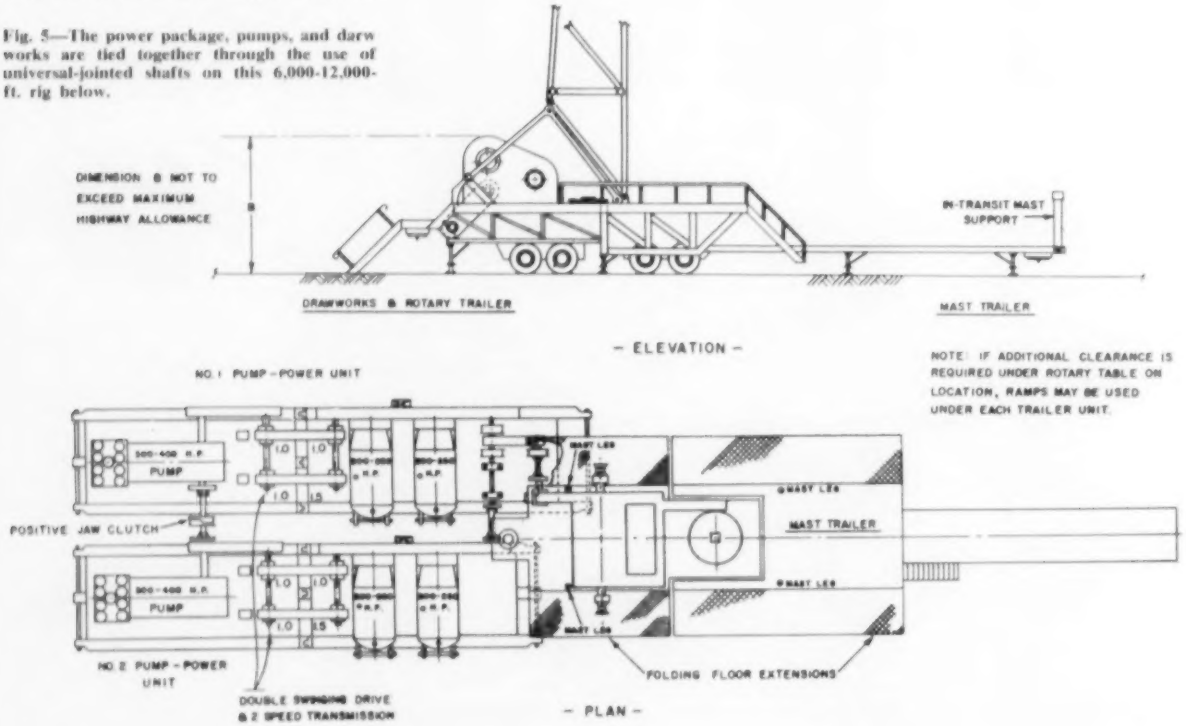
Portable Drilling Rig, 6,000-12,000 Ft.

In the 6,000-12,000-ft. rig size, there are many who seriously question whether portability obtained through the use of wheel-mounted units is practicable. From experience gained with the rig pictured as Fig. 3, it is the author's opinion that dual-trailer-mounted units, if the equipment is properly divided and due emphasis is placed on weight distribution, should prove to be most economical at least through the middle of this range.

Fig. 5 pictures the design features of the medium-depth, portable rig as envisioned by the author.

By subdividing the equipment in this manner, good weight distribution is obtained and the components of the rig, as illustrated, can be moved in six highway-permit load packages or four field-load packages. The power package, pumps, and draw works are tied together through use of universal-jointed shafts.

Fig. 5—The power package, pumps, and darw works are tied together through the use of universal-jointed shafts on this 6,000-12,000-ft. rig below.


DIMENSION B NOT TO EXCEED MAXIMUM HIGHWAY ALLOWANCE
B
IN-TRANSIT MAST SUPPORT
DRAWWORKS & ROTARY TRAILER
MAST TRAILER
– ELEVATION –
NOTE: IF ADDITIONAL CLEARANCE IS REQUIRED UNDER ROTARY TABLE ON LOCATION, RAMPS MAY BE USED UNDER EACH TRAILER UNIT.
NO. 1 PUMP – POWER UNIT
POSITIVE JAW CLUTCH
MAST TRAILER
NO. 2 PUMP – POWER UNIT
DOUBLE SWINGING DRIVE & 2 SPEED TRANSMISSION
FOLDING FLOOR EXTENSIONS
– PLAN –

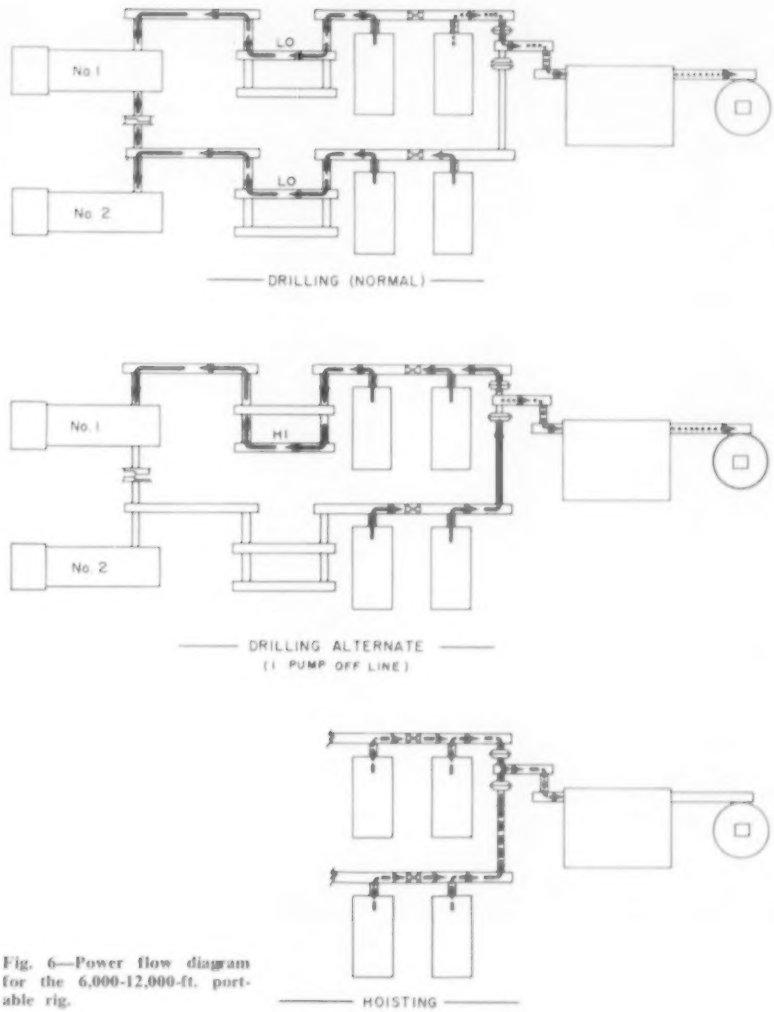


Fig. 6—Power flow diagram for the 6,000-12,000-ft. portable rig.

The power flow diagram for the rig is schematically shown in Fig. 6.

Normally for drilling operations, three of the four engines (600-750-hp.) will be compounded together through the jack shafts of the two pumps which will be operated in proper phase parallel. The fourth engine will be used to run the rotary table. If under high-torque drilling conditions the single engine is not sufficient power to provide desirable rotary operation, all engines may be compounded on the two pumps and the rotary simultaneously.

As an alternate operating method, if for any reason one pump must be removed from the line, all or any number of the engines are available for compounding on the rotary and a single (either) pump. With this condition the operator would shift into the high-speed ratio of the two-speed drive (ratioed for a safe over-speed condition) and operate this pump at an overspeed rate, and thus at a smaller sacrifice in fluid power until the other pump is placed back on the line.

Also, the further evidence of the flexibility of this rig, it should be mentioned that the rig is complete with either one or two pump-power units. Therefore, if desired for shallow work, the operator may leave either the right or left pump-power unit out of the rig up and have an economically operating rig suitable for the shallower depth range.

Unitized Heavy-Duty Drilling Rig

The discussions in the previous sections have been with regard to portable, trailer-mounted rigs of depth capacities up to 12,000 ft. The final rig to be presented is a heavy-duty rig with design thinking aimed at most proficient drilling and economical moving in deeper drilling operations. The author's company has had very little drilling experience in the Rocky Mountain area in this depth range. However, some keys to the time relationship of the various functions involved in the drilling of these wells might be obtained from a look at statistical data from medium-hard to hard-rock drilling at shallower depths with contract drilling tools in eastern Montana, Table 2.

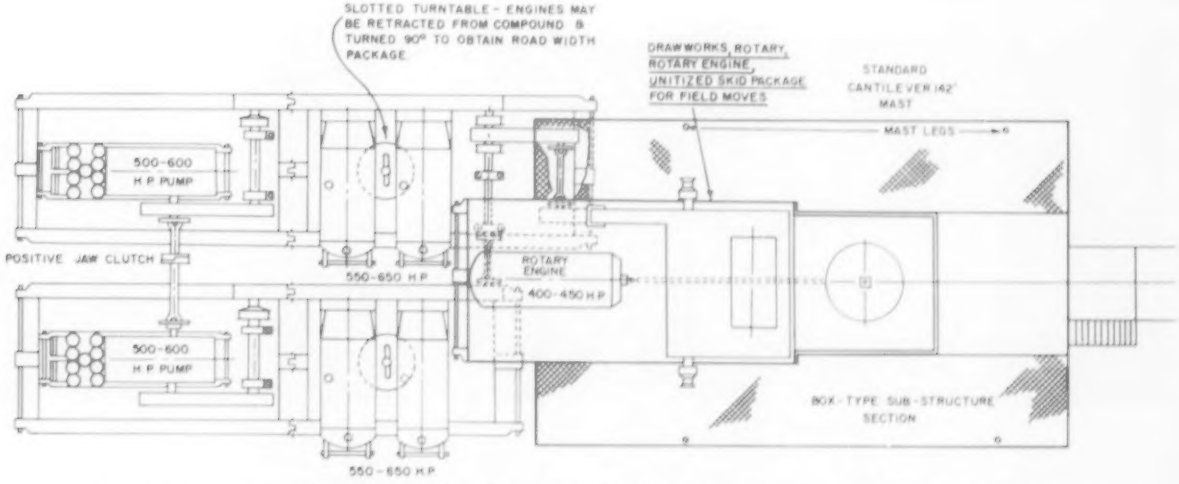

SLOTTED TURNTABLE - ENGINES MAY BE RETRACTED FROM COMPOUND & TURNED 90° TO OBTAIN ROAD WIDTH PACKAGE
DRAWWORKS, ROTARY, ROTARY ENGINE, UNITIZED SKID PACKAGE FOR FIELD MOVES
STANDARD CANTILEVER 142' MAST
MAST LEGS
500-600 H.P. PUMP
POSITIVE JAW CLUTCH
550-650 H.P.
ROTARY ENGINE
400-450 H.P.
500-600 H.P. PUMP
550-650 H.P.
BOX-TYPE SUB-STRUCTURE SECTION

Fig. 7—This unitized drilling rig is capable of drilling to 20,000 ft. and features flexibility, balance, and portability.

TABLE 1—SHALLOW STRATIGRAPHIC TESTS

Location—	Denver-Julesburg basin	North Dakota
Number of wells	3	12
Hole size	5⅝-in.	6¾-in.
Drill pipe	2⅞-in. tubing with tool joints	3½-in. drill pipe
Average depth	4,780 ft.	2,811 ft.
Average total time	238 crew hours—100 per cent	168 crew hours—100 per cent
Average move, rig up and down	29 crew hours—12 per cent	30 crew hours—18 per cent
Average drilling time	111 crew hours—47 per cent	77 crew hours—46 per cent
Average number of trips per well	Nine—3.1 hours per trip	Eight—2 hours per trip
Average trip time per well	20 crew hours—12 per cent	16 crew hours—10 per cent

TABLE 2—EASTERN MONTANA DRILLING-TIME ANALYSIS

Number of wells	8	
Hole size	9-in.	
Average depth	9,366 ft.	
Average total time	2,245 crew hours	100 per cent
Average rig up and down	208 crew hours	9 per cent
Average drilling time	790 crew hours	35 per cent
Average number of trips per well	51	4.35 hours per trip
Average trip time per well	222 crew hours	10 per cent

Naturally, as operations extend to greater depths with present designs of equipment, we would expect the actual total time allotted to each function to be increased; however, the percentage of time for these functions should not change too greatly.

Fig. 7 illustrates a rig for the greater depth ranges which has had flexibility, balance, and portability considered as design principles. This rig does not have any wheel-mounted units or other than conventional mast features.

For drilling, by divorcing the rotary from the pumping operation and splitting the compound, extreme flexibility of pump operation is obtained; 1,000-1,200 hp. is available when the pumps are run in proper phase parallel. By having separate power plants on each pump, if the jaw clutch between their jack shafts is disengaged, the two pumps may be run in compound (series) with the same available horsepower (1,000-1,200). Separate power plants or speed adjustment of the two pumps is necessary for two pumps operating in series because differences in volumetric efficiency of the high and low-pressure pumps require slight differences in their operational speeds. By providing torque converters or two-speed drives, safe overspeed emergency operation of either single pump can be obtained in the previous section on medium-depth rigs.

For hoisting, all horsepower on the rig, with exception of that driving the rotary engine, can be connected into the power train.

Proper packaging or unitization for field moves and division of loads for highway moves are also design features of this rig. Ground-level pumps and engines should also contribute to the ease in moving such a rig.

Summary . . . It is the author's opinion that by proper attention to the manner in which conventional or near-conventional components of drilling rigs are put together to form the integral drilling unit, the user for his current investment can obtain a plant which he can move with less expense and which will have horsepower available when and where needed. His thoughts, coupled with the thoughts of others in the drilling industry relatively to this subject, have been presented here. Few thoughtful readers will accept this treatise in its entirety; however, it is hoped that there will be some who will obtain ideas worth applying.

Gas Testers Honored at N.G.A.A. Dallas Meeting

AN important but little known group of oil men, the gas testers, were honored by the Natural Gasoline Association of America during its recent annual convention in Dallas. Ten representatives of the gas-testing fraternity were presented with sterling-silver medallions, symbol of the N.G.A.A. Recognition Award. Presentation was made at the presidents' luncheon by George P. Bunn, Phillips Petroleum Co.

"Few of the general public and not all oil men realize the important role the gas tester has played in the natural-gasoline industry," said Bunn. "The gas tester is the man who drives his test car upward of 30,000 miles a year to determine the gasoline content of the gas bought and sold by his company on every oil lease involved. His findings set the value of that gas to the processor. In honoring these 10 men, each of whom is a veteran of more than 30 years' service as a gas tester, the N.G.A.A. is according to all gas testers the long overdue recognition of the industry for a job well done."

A. L. Tarver, Phillips Petroleum Co., Borger, Tex.; A. W. Olson, Sinclair Oil & Refining Co., Taft, Tex.; W. H. Shepperd, Sr., Pure Oil Co., Van, Tex.; L. L. Baker, The Texas Co., Midland, Tex.; Frank B. Whayman, Shell Oil Co., Tulsa; F. L. Crawford, Magnolia Petroleum Co., Breckenridge, Tex.; Charles B. Holmes, Stanolind Oil & Gas Co., Tulsa; William L. Todd, Gulf Oil Corp., Tulsa; Stanley A. McAnelly, Lone Star Producing Co., Ranger, Tex.; Paul M. Childers, Continental Oil Co., Ponca City, Okla., and George P. Bunn, Phillips Petroleum Co., Bartlesville, Okla., who presented the N.G.A.A. awards to 10 representative gas testers.

How Richfield Tackled Hydrogen Blistering

. . . at its new Wilmington fluid cat cracking unit

by B. W. Neumaier and C. M. Schillmoller

RICHFIELD OIL CORP. is making an all-out effort to avoid low-temperature hydrogen attack at its new Wilmington fluid unit.

Most sulfides, and a large portion of other acidic compounds, are removed early in the process stream. Hydrogen sulfide is absorbed in a diethanolamine solution ahead of the second-stage compressor, and an extensive water wash is applied at the main fractionator overhead and at the first-stage compressor aftercoolers.

Of the 134,000 lb. per day of corrosive constituents, only 16,000 lb. per day reaches the gas plant, where the great majority of hydrogen attack occurs. Additional protection is provided for the deethanizer and depropanizer overhead equipment by caustic washing and drying of the feed to these towers.

Paper presented at midyear meeting A.P.I. Division of Refining, St. Louis, May 9, under the title, "Deterrence of Hydrogen Blistering at a Fluid Catalytic Cracking Unit." Authors are with Richfield Oil Corp., Wilmington, Calif. Note: Authors' introductory remarks about theory of hydrogen blistering have been deleted.

Two vulnerable locations are created: (1) the towers and overhead equipment of the diethanolamine stripper; and (2) the sour-water reclaimer. Both are protected by a corrosion inhibitor; also, the feed to the water reclaimer is neutralized.

Polysulfide injection facilities are on standby to transform the cyanide promoter into harmless thiocyanate and to protect the vessel walls at the fractionator overhead and first-stage compressor systems. Inhibitor facilities are available for additional protection at the absorber-demethanizer and at the debutanizer overhead equipment.

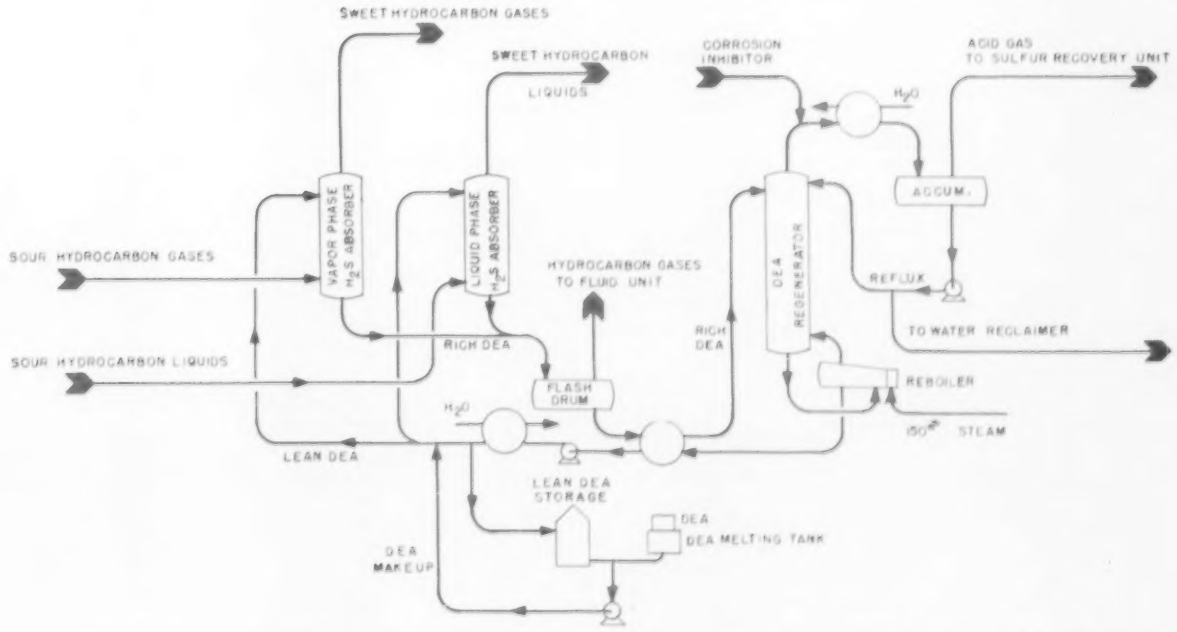
The fluid unit came onstream in July 1954 and has been in operation now for 10 months. This is not sufficient to evaluate fully our approach to minimize corrosion and, in particular, to avoid hydrogen blistering. However, a preliminary study indicates that the method is effective.

H_2S removal . . . The hydrogen sulfide absorbers are located ahead of the high-pressure section of the gas plant. The diagram in Fig. 1 shows process flow. The rich solutions are fed to a common diethanolamine regenerator tower where the hydrogen sulfide gases are stripped and sent to a sulfur-recovery unit. Both absorbers are designed for 99½ per cent hydrogen sulfide removal.

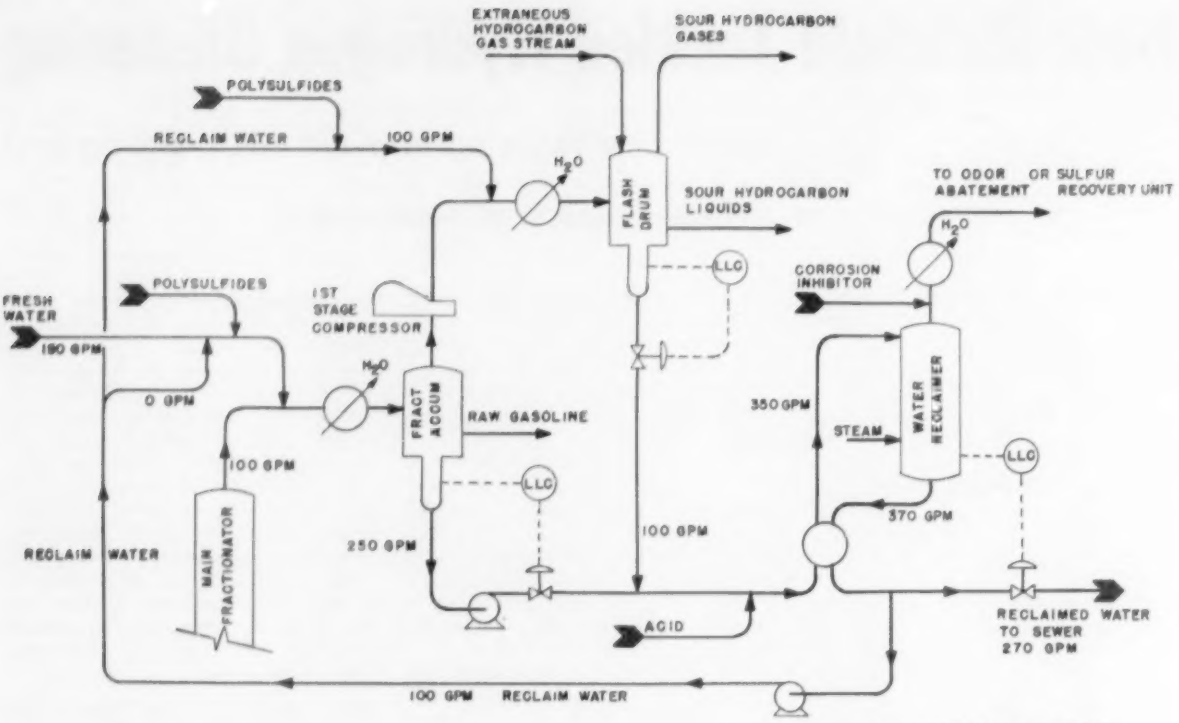
A caustic wash was installed ahead of the deethanizer to remove mercaptans and to insure a sulfur-free polymerization feed. The caustic wash also provides momentary protection against short-period failures of the diethanolamine system. By following the caustic wash with a drier, an additional safeguard is obtained against hydrate formation in the refrigerated deethanizer condenser. This also prevents water from freezing out.

Water washing . . . An extensive water wash is applied for the following reasons:

1. To remove a large part of the cyanides and aliphatic acids from the gas stream. These active promoters of hydrogen blistering are selectively extracted in the high pH water phase. By doing so, the concentration of these components are reduced to a safe level.
2. To reduce the concentration of acidic components in the water phase



HYDROGEN-SULFIDE ABSORBERS are located ahead of the high-pressure section of Richfield's gas-recovery plant. Fig. 1.



RICHFIELD COMBATS CORROSION with fresh-water wash and provisions for adding polysulfides and corrosion inhibitor. Fig. 2.

by dilution and, in that way, to alleviate hydrogen attack at the location of water wash.

Refineries have obtained the best results with water-washing in cases where the water contained air. This gave the additional benefit of polysulfide formation which transformed cyanide into thiocyanate. In some instances, smaller water washes—e.g., to remove salt formations in the absorber—have invited hydrogen blistering to occur at that or the following vessel in the process stream.

The diagram in Fig. 2 shows how provisions were made for a fresh-water wash of 150 g.p.m. capacity on the main fractionator overhead stream ahead of the condensers, and a reclaim-water wash of 100-g.p.m. capacity ahead of the first-stage compressors' aftercoolers. The fresh water is zeolite treated, free of suspended matter, and does not contain calcium or magnesium (these can form salt deposits in condensers).

Practically all oxygen is removed from the wash water in the lime treater. Unfortunately, no air-containing water can be used in Richfield's water-wash system because the oxygen would contaminate the diethanolamine solution by formation of thiosulfates. The stream to the reactor and main fractionator—which accounts for approximately 100 g.p.m. of condensate—does not contain oxygen either, inasmuch as the boiler feed is deaerated.

The reclaim water—which is the bottoms from the water reclaimer—is free from sulfides, contains relatively small quantities of acidic components, and has a fairly high ammonia content. If so desired, reclaim water can also be used for the wash at the main fractionator overhead stream, so long as the fresh-water rate is correspondingly reduced so as not to exceed design rate of 250 g.p.m. at the fractionator water draw.

Evaluation of the Protective Steps

To evaluate the steps taken to control corrosion at the fluid unit, analyses were carried out on all process streams throughout the unit for ammonia, cyanide, thiocyanate, sulfide, carbonate, phenol, and aliphatic acid. Two series were taken—one without a water wash, and one with the maximum-design wash applied at both locations.

This balance showed that the total amount of corrosive constituents in the F.C.C. main fractionator overhead stream and in the extraneous streams to the unit (T.C.C. and thermal dry gas and debutanizer overhead) approximates 134,000 lb. per day. A breakdown of these components is given in Table 1.

Of the 134,000 lb. per day of corrosive constituents in the system, roughly 30,000 lb. is removed by the water, 88,000 by the diethanolamine solution, and only 16,000 reach the gas plant. Removal of the individual constituents is shown in Table 2.

The sulfide removal by the diethanolamine solution is very good. Concentrations are reduced from 43,360 p.p.m. in the flash-drum vapor to 425 p.p.m. in the feed to the second-stage compressors. This is further diluted to 50 p.p.m. in the absorber - demethanizer when mixed with the liquid feed to this tower. The diethanolamine solution also

TABLE 1—TOTAL CORROSIVE CONSTITUENTS IN THE FLUID-UNIT SYSTEM
(Pounds per day)

Constituents—	F.C.C. main fractionator overhead stream	Extraneous streams	Total constituents
Ammonia	7,000	400	7,400
Sulfides	57,000	29,000	86,000
Carbonates	26,000	6,000	32,000
Cyanides and thiocyanates	1,500	500	2,000
Phenols	7,000	100	7,100
Aliphatic acids	5,500	1,000	6,500
Total	104,000	37,000	141,000

TABLE 2—REMOVAL OF CORROSIVE CONSTITUENTS BY WATER AND BY DIETHANOLAMINE SOLUTION
(Pounds per day)

Constituents—	Total constituents	Removed by total water	Absorbed by diethanolamine solution	Balance to gas plant
Ammonia	7,400	6,300	700	400
Sulfides	86,000	21,100	64,200	700
Carbonates	32,000	4,000	21,500	6,500
Cyanides and thiocyanates	2,000	1,000	400	600
Phenols	7,100	1,750	100	5,250
Aliphatic acids	6,500	1,850	1,600	3,050
Total	141,000	36,000	88,500	16,500

extracts a large quantity of cyanides, thiocyanates, and aliphatic acids.

The total removal of acidic constituents in the water is good. Table 3 shows the removal by the total water, the removal by the natural water in the system (condensate), and the removal by the applied water wash (obtained by difference).

No facilities for water-washing the extraneous T.C.C. and thermal dry-gas streams are provided as yet. These streams enter the top of the flash drum and contain more than 31,000 lb. per day of corrosive constituents. This extraneous stream is not considered in the evaluation of the water wash in Table 3.

TABLE 3—REMOVAL OF CORROSIVE CONSTITUENTS BY APPLIED WATER WASH
(Pounds per day)

Constituents—	Removed by natural water	Removed by applied water
Ammonia	4,300	2,000
Sulfides	11,200	9,900
Carbonates	2,500	1,500
Cyanides and thiocyanates	550	450
Phenols	1,050	700
Aliphatic acids	800	1,050
Total	20,400	15,600

Table 3 shows that if no water wash is applied, the natural waters in the system remove 20 per cent of the constituents, whereas a 250-g.p.m. applied water wash removes an incremental 15 per cent. These figures indicate that the removal of corrosive constituents from a hydrocarbon stream by a water wash is not particularly effective. The benefit of water-washing to combat hydrogen blistering is seen more in the fact that the concentrations of acidic components in the water phase are reduced by dilution.

Hydrogen-Blistering Control

As part of the hydrogen-blistering control program, a system of 29 hydrogen probes was installed to detect hydrogen penetration at an early stage in case the hydrogen sulfide removal and water wash were not adequate to protect the complete fluid-unit gas plant.

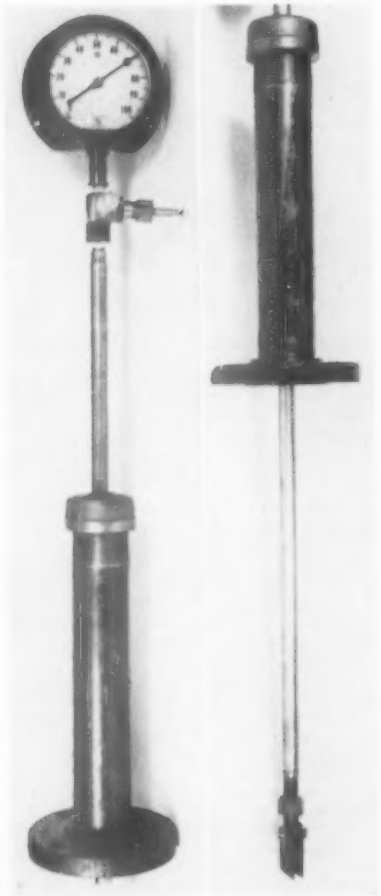
Probes in key positions were either doubled or made accessible during operation. All probes are being read twice weekly by one of the operators at the fluid unit, and the readings are being noted on a monthly probe sheet. So far, the activity at all probe locations, even in the startup period or while a reduced or no-water wash was applied, has been nil, except for the probes in the water-reclaimer vapor outlet line and in the diethanolamine-regenerator reflux line, which showed hydrogen penetration.

In addition to the probe readings, the laboratory carries out twice-weekly determinations of iron counts and pH values at all fluid-unit water draws, as well as frequent qualitative tests for cyanides and thiocyanates. Occasional painted-can tests are taken.

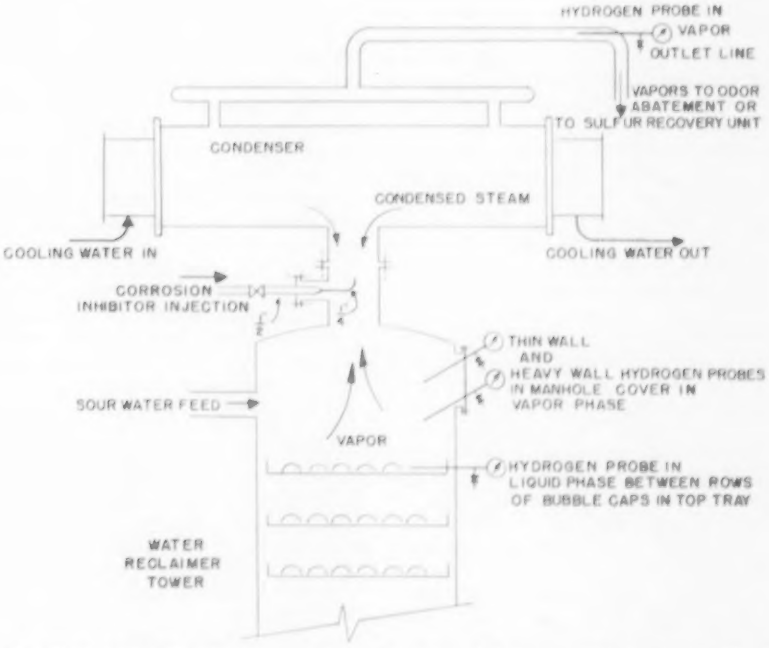
These laboratory determinations show that:

1. The pH values of all water draws are in the range of 8.5 to 9.6.

2. Fairly large concentrations of cyanides are present in the flash drum and debutanizer overhead accumulator, high cyanide concentrations in the diethanol-



HYDROGEN PROBES are built with a special retractable test-coupon assembly. Fig. 3.


HYDROGEN PROBE IN VAPOR OUTLET LINE
VAPORS TO ODOR ABATEMENT OR TO SULFUR RECOVERY UNIT
CONDENSER
CONDENSED STEAM
COOLING WATER IN
COOLING WATER OUT
CORROSION INHIBITOR INJECTION
THIN WALL AND HEAVY WALL HYDROGEN PROBES IN MANHOLE COVER IN VAPOR PHASE
SOUR WATER FEED
VAPOR
HYDROGEN PROBE IN LIQUID PHASE BETWEEN ROWS OF BUBBLE CAPS IN TOP TRAY
WATER RECLAIMER TOWER

OVERHEAD CONDENSER is mounted directly on top of the water-reclaiming tower. Fig. 4.

amine-regenerator reflux water, and a high concentration of thiocyanates in the absorber - demethanizer dehydrator. The thiocyanates are thought to be the result of oxygen contained in the extraneous T.C.C. and thermal dry-gas streams.

3. Painted-can tests are negative, except at the sour-water feed to the reclaimer, and at the flash drum when no water wash was applied.

Corrosion Environment

With the protection of the high-pressure stabilization section of the fluid-unit gas plant by a hydrogen sulfide removal and water-wash system, it was expected that severe corrosion would occur at the diethanolamine regenerator and at the water reclaimer, where most of the sulfides and other acidic salts are concentrated.

Referring to Table 2, we see that approximately 64,200 lb. per day of hydrogen sulfide and 21,500 lb. per day of carbon dioxide are stripped out of the diethanolamine solution at the regenerator, along with fairly large quantities of cyanides, aliphatic acids, and ammonia.

These salts, in the presence of roughly 1 mole of water per mole of acid gas stripped, create a very potent solution. The unit was initially operated with total reflux which allowed a buildup of the acidic components to a high concentration.

Richfield's unit is constructed of carbon steel throughout with a ⅛-in. corrosion allowance, all welds being stress-relieved. Provisions were allowed for injecting a corrosion inhibitor in overhead line ahead of the condenser (see Fig. 1).

To evaluate the corrosion rate and the hydrogen-penetration rate, a special retractable hydrogen-probe-test-coupon assembly was installed (see Fig. 3).

The assembly can be inserted through a valve into the stream during operation and periodically removed for determination of the corrosion rate and for inspection of the probe.

The unit started up without the introduction of a corrosion inhibitor and, in the first 24 hours of operation, the probe pressure increased by 48 psi. Immediately, a filming amine inhibitor was introduced at a rate of 3 gal. per day while the equipment was clean, and probe activity was halted completely. The injection rate was then adjusted to 2 gal. per day to maintain a concentration of 50 p.p.m. in the lean diethanolamine solution.

The severity of hydrogen attack in the regenerator tower and overhead equipment may be reduced by substituting steam condensate for condensed overhead as reflux. In this way, recycle of cyanide and other acidic salts which tend to build up to a high concentration in the overhead system may be eliminated.

Water reclaimer . . . Waters drawn from the fractionator overhead accumulator and flash drum are fed to the water reclaimer to strip out the sulfides, permitting the disposal of water to the sewer system. The overhead gases are sent to the sulfur-recovery unit. Smaller quantities of water drawn from the absorber-demethanizer dehydrator, debutanizer accumulator, and diethanolamine-regenerator reflux also feed into the water reclaimer.

The feed components to the unit are approximately those indicated in Table 2, under "Removed by Total Water"; i.e., 6,300 lb. per day of ammonia and 29,700 lb. per day of corrosive constituents. The pH of this sour water is about 9.2.

The water - reclaimer unit is constructed of carbon steel with a ¼-in. corrosion allowance on the tower. The overhead condenser is mounted directly on top of the tower in a fashion as shown in Fig. 4, so that no overhead accumulator is required. The tower is equipped with 15 trays with bubble caps. No alloys are employed.

Facilities were provided to inject a corrosion inhibitor into the short connection between the tower and the condenser. A pitot-shaped ¼-in. tube is used, curved upward, and in the middle of the vapor stream, to invite entrainment of the nonvolatile inhibitor for protection of the condenser. A duplex pumping unit of adjustable capacity is used for the continuous inhibitor injection.

Four hydrogen probes were installed in this system: one in the vapor outlet line past the condenser; two in the manhole cover in the top of the tower in the vapor phase; and one in the liquid phase positioned between the bubble caps on the top tray, where the most corrosive medium is expected. Fig. 4 shows these locations. Inasmuch as these probes are not accessible during the operation of the unit, thin and heavy wall probes were selected for the vapor phase.

No corrosion inhibitor was used in the initial operation of this unit. Iron counts taken on the sour-water feed and the reclaimer tower bottoms indicated a high rate of corrosion. Occasional probe activity showed on the probes in the vapor phase of the tower, and steady increases of several pounds a day showed at the vapor outlet probe. The painted-can test showed positive on the sour-water feed to the tower.

After 1 month of operation, a filming amine type of corrosion inhibitor was injected at a rate of 6 gal. per day to maintain an inhibitor concentration in the tower of 12 to 16 p.p.m. This has been found effective in lowering the iron counts and in stopping probe activity, even in the vapor outlet line. This indicates that some of the inhibitor is entrained in the vapor leaving the condenser. Weekly analyses for inhibitor in the reclaimer bottoms indicate that most of the inhibitor leaves at the bottoms. No visual inspection has been made to date, so the full effectiveness of the protection in the overhead condenser is unknown. Iron counts indicate a low rate of corrosion in the tower itself.

Because of the high pH of the sour-water feed (9.2), only 90 per cent to 96 per cent of the sulfides could be stripped, and the reclaimer bottoms had too high a sulfide content to be disposed of in the refinery sewer system. This was solved by sulfuric acid injection into the sour-water feed line. A duriron section with mixer is employed here with a continuous pH control at 7.3. The acid injection, neutralizing the sour-water feed, is also beneficial from a corrosion and hydrogen-blistering angle. Painted-can tests on the neutralized water show negative, whereas those ahead of the acid-addition point cause big blisters under the paint.

Acknowledgment

The authors wish to express their appreciation to Richfield Oil Corp. for permission to publish this paper. Thanks are due to E. C. Herthel for promoting the investigation into the problem of hydrogen blistering, and to our many associates in the refinery who assisted in the various phases of the work.

Bibliography

1. C. A. Zapffe, "Boiler Embrittlement," Trans. A.S.M.E. 66, 103-4 (1944).
2. M. H. Bartz and C. E. Rawlins, "Effect of Hydrogen Generated by Corrosion of Steel," Corrosion 4, 187-206 (1948).
3. M. H. Bartz and C. E. Rawlins, "Hydrogen Blistering of Steel: A Source of Damage to Vessels," Petroleum Processing 4, 898-901, 904-6 (1949).
4. N. Schofer, "Corrosion in Fluid Catalytic Cracking Units," Corrosion 5, 182-8 (1949).
5. M. H. Bartz and C. E. Rawlins, "Hydrogen Blistering Reported by Several Oil Companies," Proc. A.P.I. 29M (III) 145-62 (1949).
6. R. T. Effinger, M. L. Renquist, A. Wachter, and J. G. Wilson, "Hydrogen Attack of Steel in Refinery Equipment," Proc. A.P.I. 31M (III) 107-33 (1951).
7. W. A. Bonner, H. D. Burnham, J. J. Conradi, and T. Skei, "Prevention of Hydrogen Attack on Steel in Refinery Equipment," Proc. A.P.I. 33 (III) 255-72 (1953).
8. T. Skei, A. Wachter, W. A. Bonner, and H. D. Burnham, "Hydrogen Blistering of Steel in Hydrogen Sulfide Solutions," Corrosion 9 (5) 163-72 (1953).
9. J. S. Ball, C. A. VanderWerf, G. Waddington, and G. R. Lake, "A.P.I. Research Project 52—Nitrogen Constituents in Petroleum," paper presented to a group session on fundamental research during the thirty-fourth annual meet of the A.P.I., Chicago, Nov. (1954).

Planning and building the REFINERY for minimum MAINTENANCE

by R. E. Redfield

MINIMUM maintenance costs can be obtained if full consideration is given to (1) use of properly installed high-quality materials; (2) proper sizing of equipment; (3) installation of the least number of pieces of equipment; (4) maximum standardization; and (5) built-in provisions for specific maintenance problems.

Two refineries in France were rebuilt following these principles. Both refineries now have excellent maintenance records.

- Tubular heat exchangers were standardized to provide three designs.
- Process pumps are limited to four different sizes.
- Furnaces were designed with tubes of only two lengths, two diameters, and two wall thicknesses.
- Piping was essentially all welded, with many connections of ring-joint flanges.
- Most pumps are electrically driven, and only process steam is needed outside the powerhouse.

Costs vary widely . . . A study of maintenance costs in several refineries of comparable capacity and production showed very sharp differences, both in total costs and in unit and facility costs. It was not easy to find out reasons for these differences.

However, two general conclusions were reached: (1) some variations were the result of efficiency of work planning and performance; and (2) far greater differences existed in factors which govern the total maintenance work load. These have to do with the design, layout, and adequacy of refinery facilities and the total number of pieces of equipment to be maintained.

Since almost all these factors are fixed during construction, we can conclude that maintenance costs depend to a great extent on the initial selection of equipment and materials, and the manner in which they are installed.

French refineries . . . The rebuilding of two refineries in France following World War II will be used as an example of how some of these factors were considered.

Author is with Socony Mobil Oil Co., Inc., New York. Paper presented at A.P.I. Division of Refining meeting, St. Louis, May 12, 1955.

One refinery is located on the Seine River in Normandy and had a former capacity of 5,000 bbl. per day of crude oil. It was rebuilt for a capacity of 18,000 bbl. per day, which is processed primarily for lubricating-oil production. The lubricating-oil processing units include deasphalting, solvent treating, solvent dewaxing, and hot-clay contacting.

The second refinery is located near the Mediterranean, in southern France. It had a capacity of 3,500 bbl. per day of crude oil and was rebuilt to process 25,000 bbl. per day for white and black products. It is equipped with catalytic cracking in addition to the other usual facilities.

War damage . . . Both of these refineries were badly damaged by bombing during the war, and in one of them almost all of the processing units were dismantled and shipped into Central Europe during the occupation. Some of this equipment was recovered and reused in the early rebuilding stages.

Toward the end of the war, when private industry started to reestablish itself, there were critical shortages of all construction materials. Equipment manufacturers could not estimate delivery dates with any degree of accuracy. Steel and alloys were stringently allocated and obtainable only in limited amounts.

The short-supply situation in all types of materials led to the establishment of two broad policies: (1) the equipment installed would be of ample size and of the best quality; and (2) a minimum amount of material would be used consistent with the projected operations.

These policies were carried out in a number of instances, as follows:

Tubular Heat Exchangers

When the rebuilding started, there were no firms in France set up to design and build tubular equipment. Nor was there foreign exchange available to import fabricated units. This led to a decision to design a few basic units adaptable to the various services, which could be readily fabricated from standard materials in the refinery shops or in outside job shops.

Accordingly, three units were designed in approximate sizes of 300 sq. ft. 1,000 sq. ft., and 3,000 sq. ft. of surface. These were built as required to the extent of more than 450,000 sq. ft. of surface in over 300 separate units.

The shells corresponded to A.P.I. pipe sizes in diameters of 16, 26, and 42-in. Standard welding flanges and fittings were used throughout. Most of the units were built for 150-psi. operating pressure. For higher ratings, 300 and 600-psi. flanges and fittings were used, retaining same basic diameters.

Tube bundles . . . Tube bundles were uniformly standard, using 1-in. 10-gage tubes, 16 ft. long, arranged on a 1¼-in square pitch. Tube material was predominantly carbon steel or admiralty, with other alloys being used as service conditions required.

Only one tube-bundle design was made in each size, and the tube layout was arranged so that the bundle could be used for either two-pass or four-pass service.

All units in liquid-to-liquid service were built with side-to-side segmental baffles, whereas those in vapor-to-liquid service had deflector baffles.

There were a number of maintenance advantages which resulted from this high-quality standardized construction.

All bundles of the same diameter, pressure rating, and styles of service were interchangeable. Turnaround time on operating units was shortened by replacing fouled bundles with clean ones, using a minimum of spare bundles for all units. Fouled bundles could then be cleaned for the next service. In this respect, the 1¼-in. square pitch minimized fouling and made cleaning much easier.

Much can be said in favor of using heavy-gage tubes even though not warranted by operating pressures. There is much less possibility of damage during handling of bundles and during mechanical cleaning. The use of 10-gage tubes in these units has greatly increased the service life, with proportionately lower maintenance costs.

Another great advantage has been the minimum required inventory of spare tubes and gaskets. The standard

1-in. tube is stocked in steel, in admiralty and, to a limited extent, in the other alloys. As for gaskets, there are fewer than 30 patterns required for the more than 300 units.

Process Pumps

Procurement of process pumps was another serious problem in the initial stages of rebuilding. The time required for delivery ruled out the delaying of orders until specific conditions could be established. An analysis of the projected process and transfer pumping requirements indicated that four different pump sizes, each varied with four or five impellers, could be arranged to cover all the single-stage pumping needs.

Accordingly, blanket orders were placed for large numbers of pumps in each size. Altogether, approximately 700 pumps of the same type were ordered from a single French manufacturer. Only a few multistage pumps for specific services had to be imported.

All pumps were of uniformly high quality. Specifications included cast-steel cases, ring-joint piping flanges, and all-alloy trim.

As time went on, the specific operating conditions were developed, at which time the final pump assemblies were made, using the proper type and diameter of impeller for the required service.

Good pumping service . . . The results of this combination of high quality and high degree of standardization have been excellent. The pumps have given good operating service with a minimum of upkeep. When complete preventive-maintenance inspections are due, standardization permits replacement of the entire unit by a spare. Shop overhaul of the pump is efficiently carried out. The quality of maintenance is high because mechanics have become intimately familiar with the standard pump.

Inventories of spare parts can be held down because of the duplication of sizes, and the possibility of delays because spare parts are not available is greatly reduced.

Some premium was paid for the high quality built into these pumps. However, the high service factor, low upkeep costs, and advantages of standardization have more than justified this premium.

Furnaces

Again in the case of furnaces much thought was given to a high-quality standardized construction to reduce maintenance requirements.

Ten furnaces were built in the two refineries. Of these, two in reforming service were identical. Four in atmospheric and vacuum unit service were identical except for the number of radiant tubes. The remainder were designed for specific services.

General design specifications for all furnaces included a maximum of 20 per cent excess air, a maximum transfer rate of 8,500 B.t.u. per square foot per hour in the radiant section, and 80 to 85 per cent of heat input to the oil in the radiant section.

In the construction of all 10 furnaces only two tube lengths, two tube diameters, and two wall thicknesses were used. Extensive use was made of 5 per cent chromium tubes and headers. Tube supports and hangers were high alloy suitable for the service. All firebox linings were first-quality refractory encased in steel.

The design limitations have been justified in actual service. The furnaces have been in service from 4 to 8 years. Aside from one case in which several tubes were lost because of excessive salt content of the crude oil, there have been no repairs or replacements of any consequence. Further, there is every indication that many more years of trouble-free service lie ahead if the conservative conditions are maintained.

Piping

Following the general policy, it was the intention to make process piping and yard piping as maintenance-free as possible. Special efforts were made to minimize leaks which can be the cause of a large volume of maintenance work.

All yard and transfer piping was installed aboveground on concrete supports, completely welded except for necessary access flanges. The lines were painted to protect against atmospheric corrosion. All valves were steel with alloy trim.

Also, in process areas piping was designed to be tight, and to facilitate maintenance. Extensive use was made of ring-joint flanges and alloy pipe even in borderline cases. Valves were located so as to be readily accessible for maintenance as well as operation. Piping connections to exchangers and pumps were designed so that maintenance of this equipment involved a minimum of dismantling.

The attention thus given to both yard and unit piping has resulted in reducing maintenance to a minimum. The insistence on tight piping in unit areas has almost eliminated emergency shutdowns caused by oil leaks, and housekeeping has been improved.

It is not difficult to design and build tight piping if this is made an objective in the original planning.

Tankage

Storage tanks required the largest steel tonnage in the rebuilding. Recognizing that steel requirements per barrel are progressively lower as tank capacities increase, the problem was given intensive study to arrive at minimum use. Tanks were built in the largest sizes consistent with crude-oil and product storage requirements.

Radical reductions were made in the number of rundown and intermediate storage tanks previously thought to be essential. For example, lubricating-oil processes are run on a blocked operation, with all units treating the same stock simultaneously. Using minimum-surge tanks between units, this method of operation requires about 200 less unfinished stock tanks than had been used previously.

Similarly, minimum-surge tanks were installed in place of rundown tanks between processes in the white and black product operations. In all, about 300 fewer tanks were installed in the two refineries than had previously been considered necessary.

With the great reduction in number of tanks, there was a corresponding reduction in pumps, piping, heating, and fire-protection facilities, all of which require upkeep as well as the tanks.

Steam Generation and Distribution

In rebuilding the refineries, electric drives were used wherever possible, and use of steam avoided.

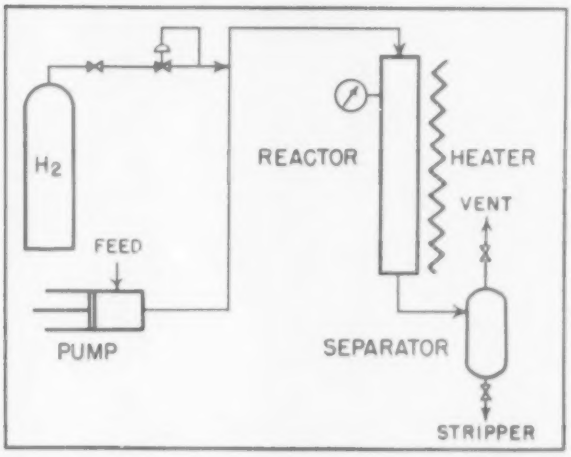
In the Normandy plant steam generation averages 140 lb. per barrel of crude-oil charge, with complete electrical generation. Sixty-five per cent of the condensate is recovered.

Steam at 150 psi. is extracted from the generator turbine for plant distribution. By necessity, some steam-driven equipment was used, and this exhausts to a 20-psi.-pressure system used for processing and tank heating.

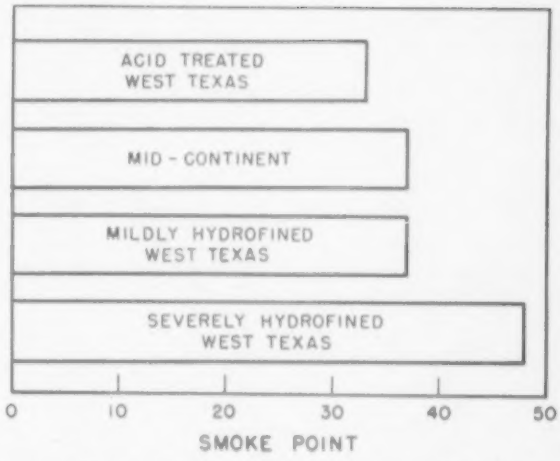
The former extensive steam loop system was replaced by minimum-size dead-end lines running to steam consumption points.

Minimum steam . . . In the Mediterranean refinery steam generation is at a minimum, averaging 40 lb. per barrel of crude-oil charge, with complete electrical generation. Special attention had to be given to steam consumption and condensate recovery because only 90 g.p.m. of fresh water for boiler feed is available. As a result, the plant is completely electrified except for four steam-driven standby pumps in critical services.

Only 150-psi.-pressure extraction steam from the generator turbines is distributed in the refinery for general processing and tank heating. The distribution system consists of 800 ft. of 6-in. and 2,000 ft. of 3-in. main lines. There is no exhaust steam system.



FLOW REACTOR used in carrying out experimental Hydrofining studies. Fig. 1.



SMOKE POINTS of Hydrofined products as compared with other refined stocks. Fig. 2.

Improving Distillate Fuels by HYDROFINING

by W. J. Zimmerschied, R. A. Hunt, Jr., and W. A. Wilson

HYDROFINING of a distillate from high-sulfur West Texas crude oil improved its quality to that of Mid-Continent distillate, with no loss of liquid product. Desulfurization was essentially complete, product was sweet, and objectionable odor eliminated.

The burning quality was measured by smoke point and by a full-scale burner test. The smoke point, a measure of sooting tendency, was improved by means of Hydrofining. Combustion deposits in the burner test were markedly lowered.

Experimental

The Hydrofining studies were carried out in the flow reactor shown in Fig. 1. The feed was a No. 1 fuel oil from West Texas crude oils high in sulfur and aromatics content.

The small amount of naphtha formed during Hydrofining was stripped under an inert atmosphere so as to give fuel oils with a flash point of 120° F. Operating conditions for Hydrofining varied over a wide range:

Temperature, 550° to 850° F.

Pressure, 500 to 3,000 psi.

Space velocity, 1 to 15 volumes per volume per hour.

Authors are with Standard Oil Co. (Indiana), Whiting, Ind. Paper presented at A.P.I. Division of Refining meeting, St. Louis, May 11, 1955.

Hydrogen, 500 to 3,000 standard cubic feet per barrel of feed.

Severity of operation, judged by the increase in hydrogen content, generally depended upon the operating conditions but also varied with the catalyst. Commercial hydrogenation catalysts were used; the choice depended upon the desired quality of the product.

Quality determination . . . The quality of the raw and Hydrofined distillates was determined by inspection tests, measurement of hydrogen content, and burning-quality tests. The inspection tests were conventional—A.S.T.M. distillation, A.P.I. gravity, flash point, pour point, color, sulfur content, and doctor test.

Hydrogen content of the liquids was measured conveniently and rapidly by beta-ray absorption. This technique gave a direct measure of hydrogen consumption during Hydrofining, a measurement which had previously been difficult with laboratory units. The burning quality was measured by smoke point and by a full-scale burner test.

The smoke point is the height, in millimeters, of a wick-fed flame in a standard lamp under conditions of incipient smoking. Smoke points were determined with the Factor lamp, modified so as to improve accuracy.

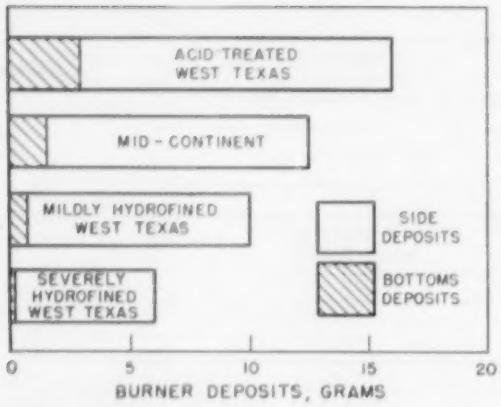
Burner tests . . . Full-scale burner tests were carried out in a modified pot-type burner under standard operating conditions. Two and one-half gallons of the fuel was burned in 20 hours. The burner was then taken apart, and side and bottom deposits were removed separately from the pot section and weighed.

Side deposits give a measure of the sooting tendency of the fuel, and have been correlated with the smoke point; the higher the smoke point, the less the sooting tendency. Bottom deposits have not been successfully correlated with the properties of the fuel; they are caused by nonvolatile impurities which are inherent in the crude oil, form during treating, or result from oxidation or other chemical reactions which accompany burning.

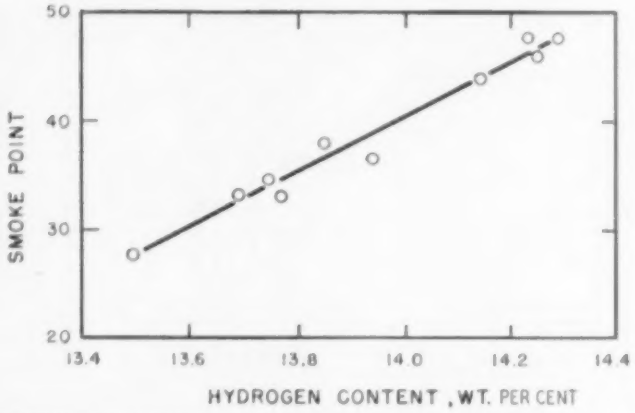
Effect on Fuel Quality

Hydrofining was found to eliminate the bad odor, reduce the sulfur content, and improve the burning quality of West Texas No. 1 fuel oil. The effects of Hydrofining are shown in Table 1. Corresponding data for the raw West Texas distillate, for a mildly acid-treated West Texas distillate, and for a good-quality No. 1 fuel from Mid-Continent crude are also shown.

Desulfurization was thorough under both mild and severe Hydrofining con-



BURNER TESTS show that burner deposits are lowered appreciably by Hydrofining. Fig. 3.



HYDROGEN CONTENTS of fuel oils show straight-line correlation with smoke tests. Fig. 4.

ditions; the original sulfur content of 0.6 per cent was reduced to 0.02 per cent or less. The products were doctor sweet and required no further finishing.

The odor of the Hydrofined products was improved to approximately that of a No. 1 fuel oil from Mid-Continent crude oil. The color before and after accelerated aging improved markedly. Even mild Hydrofining conditions gave a product of lighter aged color than Mid-Continent fuel oil.

Smoke points of the Hydrofined products are compared, in Fig. 2, with those for a mildly acid-treated West Texas distillate and a Mid-Continent fuel oil. Under mild conditions the smoke point of the West Texas distillate was increased from 33 to 37, equal to that of the Mid-Continent fuel. Severe Hydrofining boosted the smoke point to 48.

Results from full-scale burner tests are shown in Fig. 3. Mild conditions lowered total burner deposits from 16 g. to 10 g., as compared with 13 g. for Mid-Continent fuel oil. Severe Hydrofining lowered total burner deposits to 6 g. Both side and bottom deposits were reduced.

Aromatic hydrocarbons have low smoke points and give large amounts of burner deposits. Raw West Texas distillate contains 20 per cent aromatics. Mildly Hydrofined West Texas distillate and Mid-Continent fuel oil contain approximately 15 per cent aromatics. Severe Hydrofining reduces total aromatics content to 9 per cent—naphthalenes content was reduced from 4 per cent to less than 1 per cent in this instance.

Hydrogen contents of the fuel oils are plotted against the smoke points in Fig. 4. A straight-line correlation was found for smoke points between 28 and 48 and hydrogen contents between 13.5 and 14.3 per cent.

Mild Hydrofining thus gives a product equivalent in quality to a Mid-Continent fuel oil, and severe Hydrofining produces a superior fuel oil.

TABLE 1—INSPECTION OF DISTILLATES

	West Texas				Mid-Continent, sweetened
		Hydrofined		Mildly acid-treated	
	Raw	Mild	Severe		
Gravity, °A.P.I.	41	42	44	41	42
Pour point, °F.	—60	—60	—60	—60	—45
A.S.T.M. distillation, °F.:					
I.b.p.	325	320	316	325	320
E.p.	547	545	533	549	550
Color, Saybolt	16	27	30	15	17
Aged color*	5	13	30	3	9
Aromatics, vol. %	20	16	9		15
Sulfur, wt. %	0.6	0.02	0.01	0.6	0.2
Doctor test	Sour	Sweet	Sweet	Sour	Sweet
Mercaptan number†	60	0	0	4.0	0
Odor	Bad	Good	Good	Bad	Good

*After 1 hour at 290° F. †Milligrams mercaptan sulfur per 100 ml.

Conclusion

Hydrogen consumption during Hydrofining was calculated from the hydrogen content of the feed and the products. Consumption of 90 standard cubic feet per barrel of feed increased the smoke point from 33 to 37; consumption of 300 standard cubic feet increased it to approximately 48.

The yields of total liquid product—fuel oil and naphtha—were between 100 and 101 volume per cent, naphtha being about 4 per cent of the total. Hydrofining, therefore, gives a higher yield than other refining processes, such as acid treating or solvent extraction.

The byproduct naphtha produced during Hydrofining was an excellent feed for catalytic reforming. Under Ultraforming conditions a product with a research octane number of 95, clear, was produced in high yields.

The quality improvement obtained by Hydrofining the West Texas distillate is typical of that possible with other distillates. With byproduct hydrogen available from catalytic reforming units, refiners can easily improve marginal or inferior fuel-oil components to high-quality products.

Other Articles on This Subject

R. H. Brown and Seymour Meyerson, "Cyclic Sulfides in a Petroleum Distillate," Ind. Eng. Chem. 44, 2620 (1954).

J. G. Eckhouse, C. F. Gerald, and A. J. de Rosset, "Unifining Upgrading Distillate Fuels," The Oil and Gas Journal, 53 (17) 81 (1954).

J. H. Forrester, A. L. Conn, and J. B. Malloy, "Ultraforming—New Reforming Process," Petroleum Refiner 33 (4) 153 (1954).

R. A. Hunt, "Relation of Smoke Point to Molecular Structure," Ind. Eng. Chem. 45, 602 (1953).

Standard Methods for Testing Petroleum and Its Products, p. 456, Institute of Petroleum, London (1951).

R. B. Jacobs, L. G. Lewis, and F. J. Piehl, Joint Symposium on Automatic Analytical Methods in the Petroleum Industry, 124th meeting of the A.C.S., Chicago, Sept. (1953).

R. C. Morbeck, "Hydrofining of Middle Distillates," The Oil and Gas Journal, 53 (35) 94 (1955).

A. C. Patterson and M. C. K. Jones, "Hydrofining's Use in Product Improvement," The Oil and Gas Journal, 53 (24) 92 (1954).

J. F. Terry and E. Field, "The Smoke Tendency of Refined Kerosine and Its Determination," Ind. Eng. Chem., Anal. Ed. 8, 293 (1936).

G. I. Worrall, "Measuring Burning Quality of Distillate Fuels," Ind. Eng. Chem. 46, 2178 (1954).

Our interests are the same

...getting your well down in shortest possible time!

HUGHES research and the combined efforts of the HUGHES field organization* have *one purpose* . . . giving you bits that will get your well down in the least possible time . . . and at the least possible cost.

The HUGHES man responsible for servicing your rig knows from actual field experience the bits that will give you the fastest penetration and most footage in the formations you are likely to encounter. And you can depend on him to have the right bits on your rig at the right time.

**A field organization of over 400 serves the industry in the United States and Canada*

Make your Drill Stem dollar go farther

Records show that HUGHES "Flash-Weld" tool joints cost you less per foot of hole drilled. They are more economical because they last the life of your drill stem. When hardfaced they withstand the wear of abrasive formations and may be *safely* rehardfaced in the field.

Since 1938, more than 32,000,000 feet of drill pipe have been unitized with HUGHES "Flash-Weld" tool joints. When you specify HUGHES "Flash-Weld" you get the *original* integrally-welded tool joint . . . and the benefit of the industry's greatest flash-welding experience.

FLASH-WELD

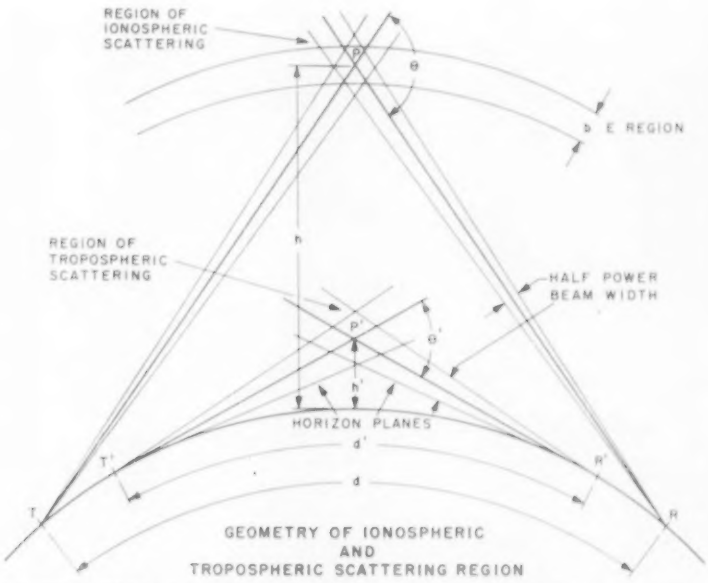
A DEVELOPMENT

OF

HUGHES

TOOL COMPANY

HOUSTON, TEXAS



SCATTER PROPAGATION is possible because of variations in refractive index in the troposphere and ionosphere. Geometry of scatter is shown here. Fig. 1.

BIG ANTENNAS are a mark of scatter systems. This is a 28-ft. dish mounted on a 50-ft. tower. Fig. 2.

New radio tool for pipelines . . .

SCATTER PROPAGATION

Scatter is a form of radio propagation which permits spacing of stations far beyond the optical range. It takes high-powered transmitters and large antennas. But with it, communication links of 100, 200, or even 1,000 miles are possible—without relay stations. Operating frequencies are in the very-high-frequency and the ultra-high-frequency bands. But scatter won't replace microwave. It will be used in special cases. For example, a pipeline system with pump stations spaced beyond microwave range might install scatter links to eliminate intermediate microwave stations.

by I. H. Gerks

THE ever-growing need for new radio channels has led to a phenomenal expansion of the useful spectrum to higher and higher frequencies. The most recent discovery which promises great usefulness is scatter propagation. This effect permits a large extension in the range of transmitters operating in the spectrum above 30 megacycles, (mc.). Before discussing this in detail, let us consider the limitations of radio propagation without scattering.

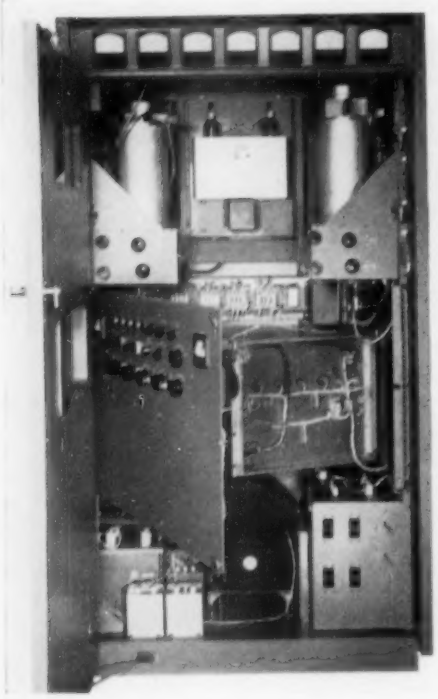
The wave radiated from a transmitting antenna in free space is attenuated solely as a result of expansion in all directions. When the transmitting antenna is placed over a spherical earth of infinite conductivity, there is no loss due to surface currents. But the wave at distant points near the surface may be greatly attenuated because of the shadowing effect of the curved surface. This effect increases as the frequency goes higher. When the perfectly conducting earth is replaced by a finitely conducting earth, there may be a large additional attenuation because of earth losses associated with the surface wave. Again this loss increases with frequency.

Line-of-sight rule . . . A rough working rule long applied to v.h.f (very high frequency) and u.h.f. (ultra high frequency) stations was that reliable signals could not be received very far beyond the horizon of the transmitting antenna. This led to the use of very tall towers for broadcast antennas and to careful location of moderately tall towers on high ground and at rather small spacing in radio relay services.

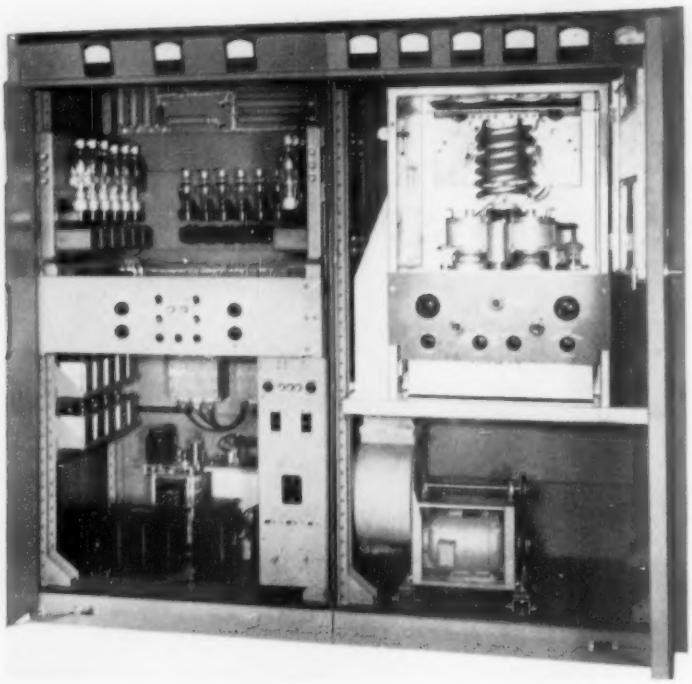
These principles are entirely sound. The broad-band signals used in television require large values of field strength which are difficult to establish far beyond the horizon. And line-of-sight microwave relay stations may use low-power transmitters and relatively low-cost antennas.

There are, however, cases where it is inconvenient or impossible to establish a chain of line-of-sight relay stations. Examples are paths containing long water obstacles or passing through uninhabited and undeveloped terrain. In such cases, scatter propagation may be employed to good advantages.

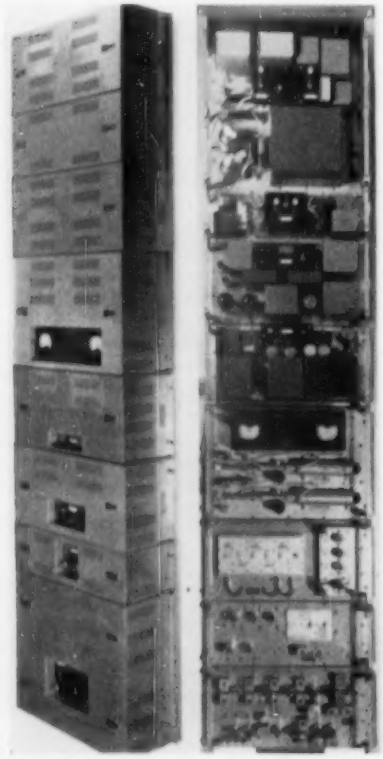
Still other cases may exist where only widely separated terminal stations are to be connected and no service to points in between is required. Here a single high-power scatter link may be



HIGH-POWER TRANSMITTERS are also needed. This transmitter for a u.h.f. scatter link operates at 1,000 mc. and puts out 1 kw. Fig. 3.



WATER-COOLED TRANSMITTER for v.h.f. scatter link has output of 20 kw. and operates in the 30-50 mc. band. Fig. 5.



EXCITER FOR U.H.F. TRANSMITTER puts out 10 watts, has a frequency deviation of 336 kc., and takes signals from 200 cycles per second to 112 kc. Fig. 4.

found more economical than a chain of low-power relay stations. It should be noted, however, that terminal equipment for a scatter system may be designed so that a combination of scatter and line-of-sight links may be used compatibly.

Until quite recently it was believed that propagation by way of the ionosphere could be achieved only at frequencies below the m.u.f. (maximum usable frequency). The m.u.f. increases with the distance. But it is rare that signals can be transmitted any distance by regular ionospheric reflection at frequencies above 30 mc.

Consequently, much interest has been shown in the recent discovery of ionospheric scattering from a turbulent layer located at a height of 80 to 100 km. Useful propagation may be obtained at frequencies in excess of 50 mc. at all times, with no need for frequency shifting due to diurnal and solar cycles, and with a minimum of atmospheric noise. The great height of the scattering layer permits spacing of terminals as far apart as 1,200 miles.

Nature of Scatter Propagation

Ground-wave propagation can occur in the absence of an atmosphere. The only effect of the atmosphere is a slight curvature of the ray toward the earth. The effect is equivalent to an increase of about 30 per cent in the effective earth radius. This model applies reasonably well up to about 20 mc.

As the wave length becomes shorter, one can no longer overlook the minute local variations in the refractive index of the atmosphere. In the troposphere, these variations result from density and humidity changes induced largely by surface convection. In the ionosphere, they result from meteoric trails and from other sources of ionization not yet fully identified.

When a wave which is originally plane passes through such a region, its different parts are advanced or retarded, so that the wave front becomes irregular. It resembles hilly terrain. When the wave length is small enough with respect to the "hills" propagation will be generally perpendicular to this irregular wave front. Therefore it deviates from the original direction of the incident ray.

Since only small distortions normally occur, the scattered power decreases quite rapidly with an increase in the angle measured from the direction of the incident ray. Consequently, useful scattering is limited to angles of only a few degrees measured from the forward direction. This explains the good preservation of small antenna beams angles and the usefulness of high-gain antennas.

As shown in Fig. 1, the troposphere region contributing most strongly to the

scattered field lies near midpath and just above the intersection of the horizon rays of the two antennas. When the antenna beams are tilted up, reception rapidly becomes poorer because of an increase in the forward scattering angle θ, (theta) and because of reduced turbulence with increasing elevation.

In the ionosphere, however, the height of the scattering layer is approximately fixed. An optimum vertical beam elevation angle exists for any given distance. Furthermore, ionospheric scattering at distances below 400 miles is poor because θ is too large. Beyond 1,000 miles, it is difficult to achieve beam elevations which are sufficiently low at the frequency involved because of impractical antenna heights. Hence, rather rapid decreases in received power may be expected beyond this range.

It is found that tropospheric scattering occurs almost equally well at all frequencies from about 30 to 4,000 mc. or more. In the ionosphere, however, the refractive index modification results from the deflection of electrons by the radio field. Since the electrons have inertia, the scattered power decreases with increasing frequency. The most useful range has been found to lie between 30 and 60 mc. At frequencies much below 30 mc. regular ionospheric propagation may occur, with the resultant chance of interference from other stations and from back-scatter.

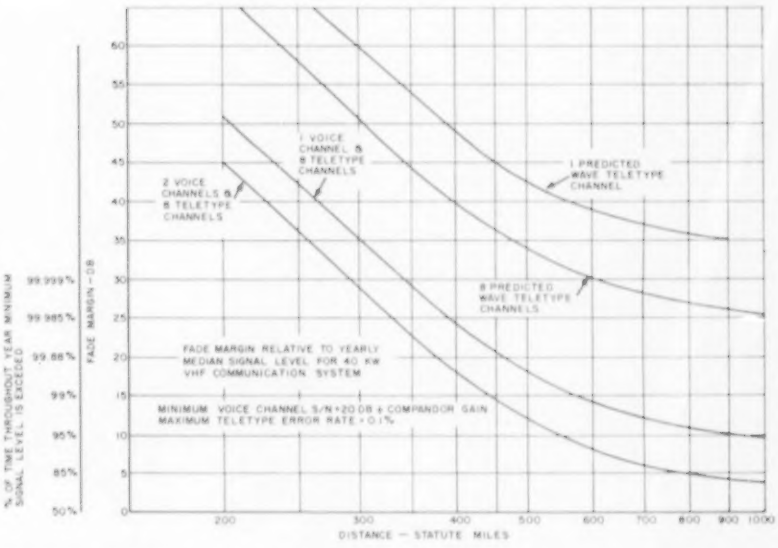
Considerations For a Scatter Link

From experiments the transmission loss relative to free space encountered in tropospheric propagation is given approximately by the formula.

$$L = 60 + 0.12\ (d-100) \qquad (1)$$

where L is in decibels and d in statute miles.

For distances less than 100 miles, the relation is no longer linear. The height of each antenna is assumed to be small, in the range 20 to 50 ft. Hence, for distances beyond 100 miles, a large part of the path is nonoptical. The height of the antenna is unimportant so long as the beam clears nearby obstacles and the height in wave lengths is large enough to give a main lobe less than a degree above the horizon. If mountainous terrain raises the line of sight significantly above the horizontal plane, the antenna beam must be correspondingly elevated. This increases θ of Fig. 1 and reduces the received power.



FADING MARGIN and circuit reliability as a function of distance for a v.h.f. scatter link. Fig. 6.

Antennas . . . Since the frequency in this case is usually hundreds or thousands of megacycles, an aperture antenna, such as a parabolic reflector, appears to be most suitable. Because of large scattering loss on long tropospheric links a narrow-beam or high-gain antenna is required at each terminal. Beam angles of less than 5° are readily obtainable.

Fig. 2 shows an experimental antenna 28 ft. in diameter mounted on a tower at a height of 40 ft. This antenna has a beam width at 1,000 mc. of a little more than 2°. Similar antennas up to 60 ft. in diameter have been proposed and are expected to be in production soon. Somewhat less than the full theoretical gain is realized in scatter propagation from antennas more than about 20 wave lengths in diameter. In spite of this loss, large antennas are justifiable.

High transmitter power is essential. The limitation is generally set by the availability of power amplifier tubes covering the pertinent frequency range. Fig. 3 shows a production-type transmitter rated at 1-kw. output, employing a tetrode amplifier, and covering the frequency range of 225 to 1,000 mc. Air cooling is employed. An air-cooled klystron amplifier of similar rating is under development. With water cooling, values of power output of 10 kw. in this frequency range are obtainable. Similar power ratings at higher frequencies can be foreseen.

A u.h.f. exciter for this type transmitter has a power output of 10 watts. It accepts signals with a frequency of 200 cycles per second to 112 kc. and has a frequency deviation of 336 kc. Such a unit is shown in Fig. 4.

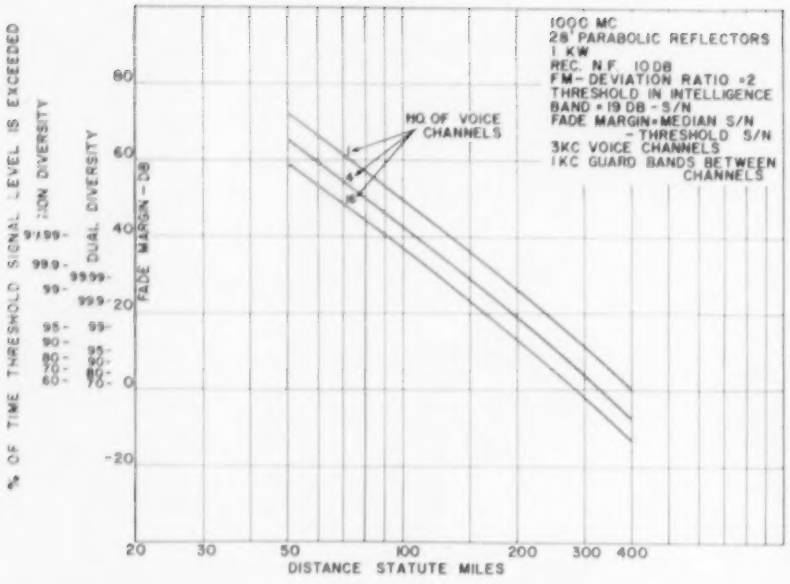
The receiver must have a low noise figure, since receiver noise and not atmospheric noise is governing. It must have a band width only sufficient to pass the necessary modulation side bands. Since multipath propagation produces fading, an important improvement in reliability can usually be achieved by space diversity.

Stable oscillator . . . An important requirement if the signal-to-noise ratio is to be a minimum, is a careful restriction of receiver band width. This in turn requires a high order of frequency stability in the transmitter and receiver carrier frequency. This is achieved with a carefully stabilized crystal oscillator operating at a fixed frequency of 1 mc. and then employing this signal to control the phase of a variable oscillator at appropriate small frequency steps.

The oscillator has a rated stability of better than 1 part in 10^8 per day. This stability is maintained in the variable oscillator because of the phase lock. Appropriate exciter and local oscillator frequencies are then derived from the variable oscillator by multiplication.

THE AUTHOR

Irvin H. Gerks is head of the wave-propagation group with Collins Radio Co. He graduated from University of Wisconsin with a bachelor of science in electrical engineering and received his M.S. in E.E. from Georgia Tech. He has been in communication work for more than 25 years, working with Bell Telephone Laboratory, teaching at Georgia Tech, and serving in the U. S. Signal Corps. He has been with Collins Radio Co. for the past 9 years.



FADING MARGIN and circuit reliability for a multichannel u.h.f. scatter link. Fig. 7.

V.h.f. Scatter Links

The transmission loss in an ionospheric scatter link cannot be simply expressed as a function of distance. It is always large except for the strong signals known as "bursts" and ascribed to the ionized trails of larger meteors. Provision must be made for this large transmission loss by the use of high-gain antennas, high-power transmitters, and a restriction of modulation band width.

With suitable antennas and terminal equipment, such a link gives reliable frequency-shift-keyed printing telegraph signals, with eight or more channels, as well as good single-side band voice signals, with one or more channels. It is doubtful that consistently good signal-to-noise ratio can be maintained with wide band forms of modulation.

Since frequencies in the range of 30 to 50 mc. must be employed in this case, long-wire or array antennas are generally used. The height is chosen to yield the optimum vertical lobe angle. An antenna gain on the order of 20 db. relative to a dipole is readily obtainable. Because of the lower frequency involved, a transmitter power of 20 to 50 kw. is practical. Fig. 5 shows a linear amplifier designed for an output of 20 kw. peak envelope power.

As in tropospheric scattering, a fading signal is encountered and space diversity reception is normally employed. In both cases the antennas may be large and costly and it is desirable to use only two antennas at each terminal. One of these is duplexed for simultaneous transmission and reception. This means that transmitting and receiving frequencies must be 3 to 10 per cent apart depending on frequency and transmitter power level. A closer spacing would require the use of impractical duplexing filters.

Operational Results

In the reception of scatter signals, a rapid and rather severe fluctuation in level is normally encountered. This fading may be ascribed to multipath propagation. An effective a.g.c. (automatic gain control) system is required in the receiver to conteract such fading. There is also a slow variation caused by changes in the average gradient of the refractive index of the troposphere or ionosphere.

In presenting values of transmission loss, received power, or signal-to-noise ratio for a radio circuit of this type, it is customary to give the median level. This is the level which is exceeded 50 per cent of the time over a long period such as a year. Measurements show that the tropospheric signal fades 24 db. or more below the median level for 1 per cent of the time without diversity, and 16 db. or more with dual diversity reception. A similar relation holds for ionospheric scatter propagation.

Low interference . . . It should be emphasized that the interference capabilities of scatter signals can be made very small. The scattering is classified as forward scattering, and the power drops rapidly as the angle between the scattered ray and the incident ray increases.

Measurements have indicated that narrow antenna beam angles are reasonably well maintained. Thus, signal reception at points well off the beam cannot occur unless the antenna has secondary lobes of large amplitude. With properly designed antennas, the side-lobe level may be kept 25 to 30 db. below the level of the main lobe. Because of the narrow beams and the smaller number of transmitters involved, a scatter propagation system should have lower interference capabilities than a multistation, low-power relay chain.

It is well known that the multipath propagation occurring on regular ionospheric links may cause severe distortion of voice signals. This is not the case with scattered signals. The relative time delays are so short that high-fidelity transmission is obtainable with very broad modulation band widths. In fact, television relaying by tropospheric scatter appears entirely feasible.

How reliable is it? . . . The approximate values of fading margin and circuit reliability for variable distance and various numbers of channels* are indicated for v.h.f. propagation in Fig. 6 and for u.h.f. propagation in Fig. 7. In the former, we have assumed single-side band and suppressed-carrier modulation, with a transmitter power of 40 kw., and with antennas each having a gain of 20 db. relative to a dipole. The fading margin is the excess of the median received power over the power which is 20 db. above the receiver noise level in the intelligence band width.

In Fig. 7 we have assumed narrow-band frequency modulation, a frequency of 1,000 mc., a transmitter power of 1 kw., and a 28-ft. antenna at each terminal. In this case, the fading margin is the excess of the median received power over the power which is 19 db. above the receiver noise level in the intelligence band width. It should be noted that a circuit with a fading margin of 16 db. has a reliability of 99 per cent with dual diversity reception.

Scatter propagation opens a region of the radio spectrum for communication far beyond the horizon. A properly designed system requires no frequency changes to maintain continuous communication. And the quality and reliability compare with those of wire-line circuits. The narrow antenna beams and the wide spacing of terminals reduce interference capabilities. In many cases this may lead to lower installation and maintenance costs than the more conventional low-power relay system.

*The predicted wave teletype system is a Collins development in which the receiving equipment operates synchronously with the transmitting equipment, so that maximum advantage is taken of the predicted features of the receiving signal. In one form of this equipment, an improvement in signal-to-noise ratio of about 8 db. over standard frequency shift keying is realized.

Versatile Workover Truck Does Three Chores . . .

Wire-Line Work . . .

HUMBLE OIL & REFINING CO. research engineers have developed a versatile workover truck, the only one of its kind in the world. This unique mobile unit can perform all the service-truck operations usually required for working over any permanent-completion-type oil or gas well. Although it was built as an experimental model, the unit has proved so successful in field tests that it may well be the prototype of commercial service trucks of the future.

That, in fact, is the main purpose behind Humble's development of the combination unit. It is intended to demonstrate the practical economies of one-truck well servicing and so encourage commercial service companies to adopt the method. The resulting savings in workover costs would soon repay Humble's expense of development.

Cement Mixing . . .

Normally, a workover job of the type for which this unit was designed requires at least three separate service trucks and operating crews. One truck must be called out to do the wire-line work; another to do the cementing; still another for gun perforating. Often two additional trucks are needed—one to haul dry cement; the other to haul water. Inevitably there are delays when operations get off schedule; time is wasted when one truck must stand idle while another is completing its work. Since all well-service companies charge for their equipment and operators on an hourly basis, any waste of time represents additional expense.

Gun Perforating . . .

No lost time . . . With the combination workover unit, however, there are no such problems. The big truck moves onto the location under its own power, takes its position beside the ailing well, and remains there until the workover job is completed. Except for the gun-perforation instruments, which are

mounted for convenience in a station wagon, everything needed for the complete workover project is built into or stored on the truck. The diesel engine that propels the truck also powers the main pump. An auxiliary engine, mounted at the rear of the vehicle, powers the wire-line reels and hydraulic equipment. There is a cement storage bin; also built-in water tanks which double in service as cement mixing tanks. Neatly stored in various compartments on the truck are all the tools, fittings, tubing, blowout preventers, and other equipment necessary for the job at hand.

In only a few months of operation, the unusual vehicle has already demonstrated its ability to do its work better than the standard equipment, and much more economically. Judged on the basis of its limited experience to date, the combination unit bids fair to cut about two-thirds off the cost of well workovers.

Weighty problem . . . One of the biggest problems in designing the workover truck was to keep it within legal weight limits allowed on public highways. Humble's engineers had to use all their ingenuity to shave excess pounds without jeopardizing the efficiency of the unit.

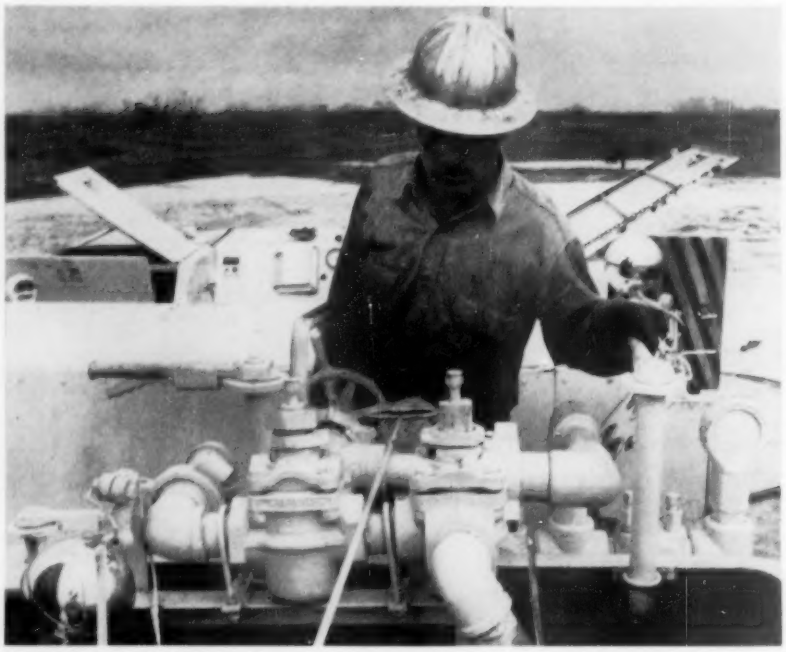
They substituted aluminum for steel wherever possible, cut large perforations in the heavy truck frame, and juggled their plans to permit better weight distribution between front and rear axles. Finally they had a vehicle that comes safely within the legal load limits. Even so, it weighs more than 20 tons fully loaded.

But weight limitations did not prevent the engineers from including several unusual features to improve the unit's operations. A good example is the hydraulic system, powered by a 32-hp. gasoline engine which has been sparkproofed for safety.

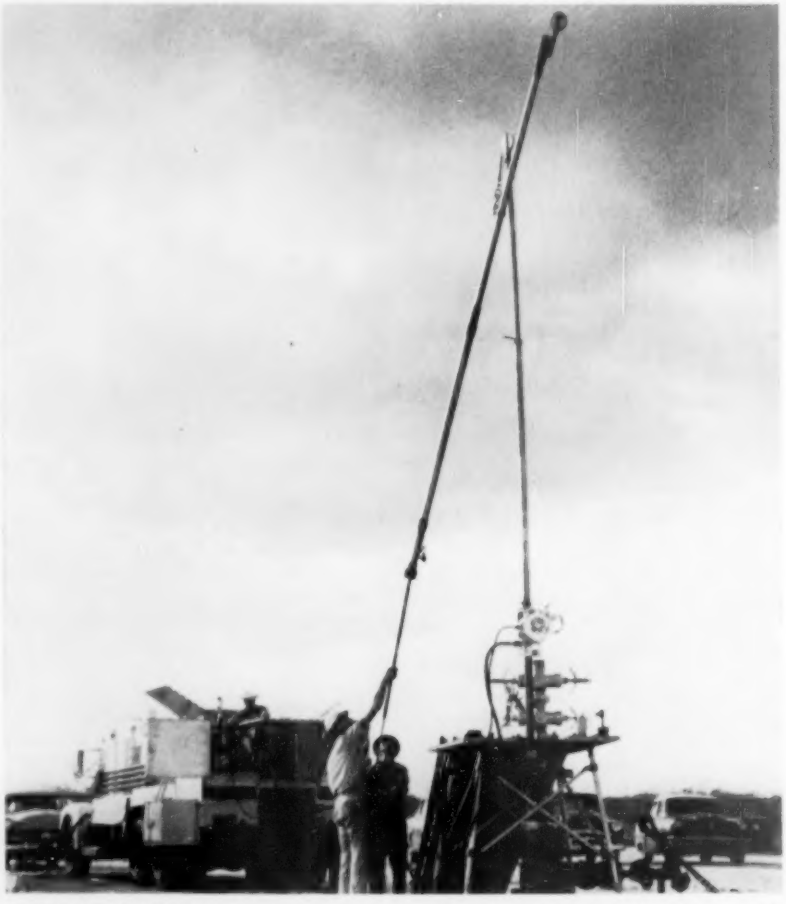
The hydraulic system operates a vane-type hydraulic motor that controls the drum reels. This gives a smoother flow of power for wire-line and cable work. An automatic bypass valve can be adjusted so as to prevent excessive pull on the line—a valuable safety factor should a tool hang up in the well.

The same hydraulic system serves two other purposes. It operates the centrifugal pump that pumps water from the pit to the tank on the truck, and it drives the hoist used to pull tubing from the well.

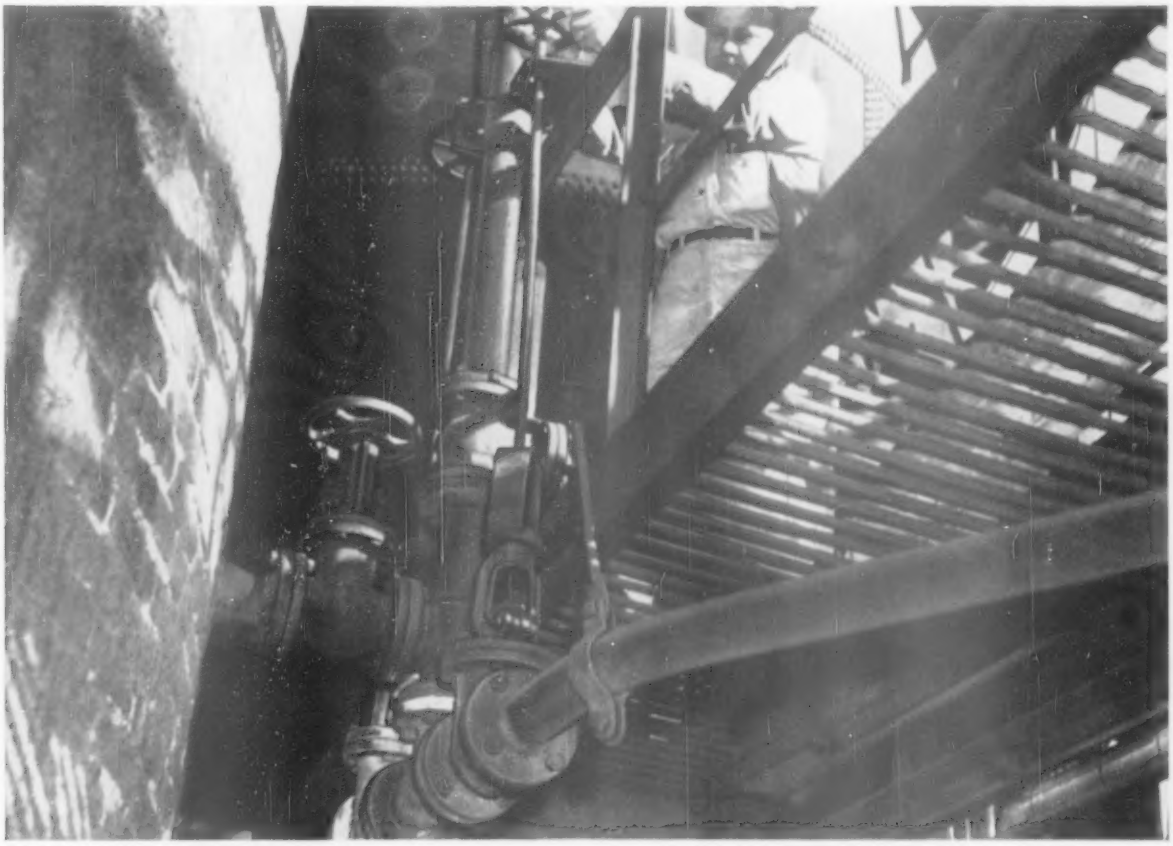
For an experimental model, the big truck unit has proved remarkably practical in field operations. It is showing the way to more economical workovers, and that is an important factor in the over-all task of keeping the nation supplied with oil.



CONTROL CENTER on deck of truck gives operator complete control over the main diesel engine and all operations involving the big pump.



WIRE-LINE WORK follows normal procedures, with reels located in rear of truck unit. Special feature is hydraulic hoist mounted on gin pole, used in pulling tubing.



93% sulphuric acid no problem for these Crane Valves

THE CASE HISTORY — No longer do petroleum processors have to be satisfied with unpredictable behavior of valves on sulphuric acid. It's still one of the toughest fluids to handle, but the "standards" for valve performance and durability are improving steadily.

For example, as shown above, a large midwestern refinery installed three Crane No. 475½ all-iron gates on 93% concentration sulphuric acid more than 2 years ago. These valves have been in continuous service on neutral agitator tanks, being operated about 3 times daily. Yet they have required no repairs whatsoever, and a recent check showed all three of these Crane valves in good working condition.

Making valves that do the job better has been Crane's main effort through 100 years of quality manufacturing. To thrifty buyers, Crane quality means greater dependability, lower ultimate cost. That's why more Crane valves are used than any other make. Crane Co., General Offices, Chicago 5, Ill. Branches and Wholesalers serving all industrial areas.

CRANE IRON BODY WEDGE GATE VALVES

Here are valves of unusual strength for their 200-pound W.O.G. rating. Body and bonnet are oval shaped, with extra metal where needed most. Their Crane-quality cast iron with highly engineered operating design makes these valves outstanding performers wherever they're used. A complete family to choose from. See your Crane Catalog or your Crane Representative.

CRANE CO.

VALVES • FITTINGS • PIPE
KITCHENS • PLUMBING • HEATING

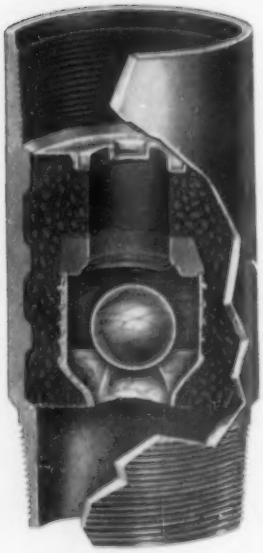
CRANE'S FIRST CENTURY...1855-1955

Geyser Float Shoe
Fig. 322

Geyser Guide Shoe
Fig. 222

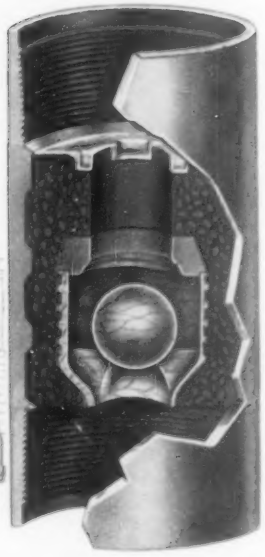
Regular Float Shoe
Fig. 382

LARKIN OFFERS A COMPLETE LINE OF EQUIPMENT



M & F Float Collar
Fig. 401

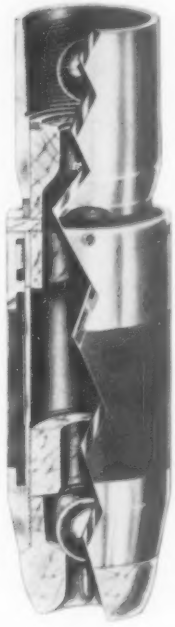
Geyser Float Collar
with Solid Bottom
Baffle, Fig. 421

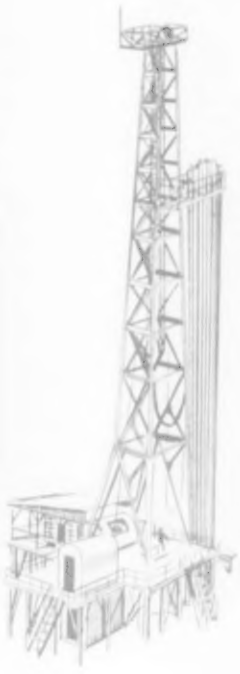


F & F Float Collar
Fig. 401

Cementrol Float Shoe with Flapper Valve Fig. 331

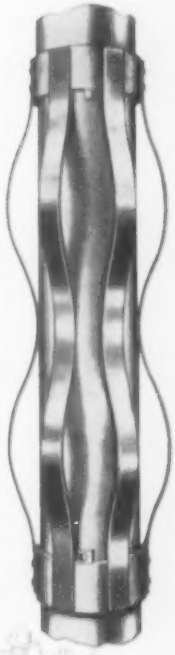
Cementrol Float Shoe Fig. 325-A





Lok-On Centralizer Fig. 905

Slip-On Centralizer Fig. 903



for safe, successful cementing of your casing.

CONVENTIONAL FLOATING AND GUIDING EQUIPMENT — Dependability proved by years of satisfactory service in hundreds of thousands of wells. Larkin is the most widely used of any such equipment.

CEMENTROL EQUIPMENT — For protecting exposed low pressure, permeable formations from contamination by cement. Originated by Larkin and growing in use year by year.

CASING CENTRALIZERS — Engineered, tested and proved to be the strongest, most durable and efficient centralizers yet developed. Furnished in both Lok-On and Slip-On types. "Tailor made" ranges to provide maximum efficiency and easy starting in any casing/hole-size combination.

For complete information on Larkin Cementing Equipment, call your nearby Larkin representative — or refer to your Larkin catalog. Larkin products are available everywhere . . . "through your supply store."

LARKIN

...Through Your Supply Store

LARKIN PACKER COMPANY, INC. • **ST. LOUIS, MO.**

Examples of Measurements of Interwell Permeability

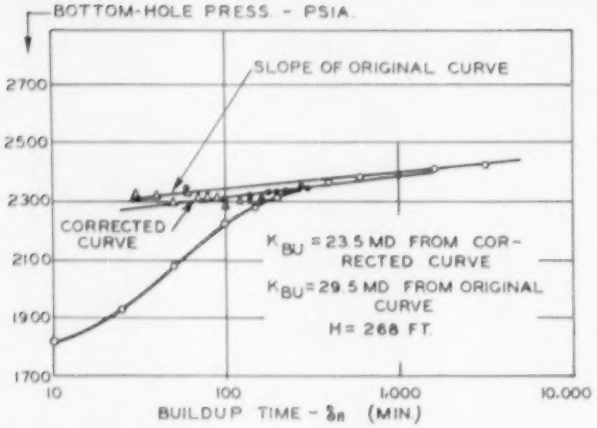


Fig. 1—Bottom-hole pressure vs. buildup time, Well No. 2.

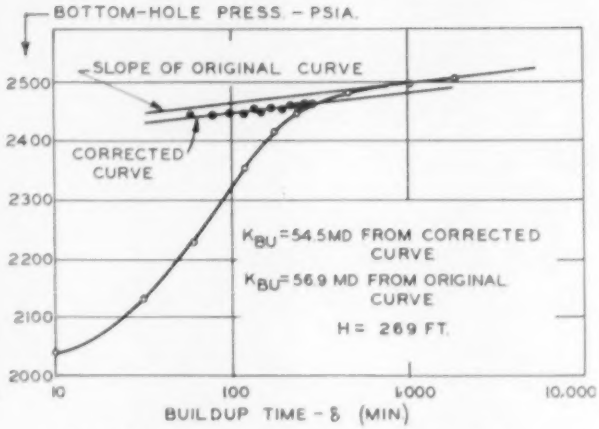


Fig. 2—Bottom-hole pressure vs. buildup time, Well No. 3.

These figures illustrate how early pressure-buildup data can be used to measure interwell permeability. The pressure-buildup data, collected during the first 5 hours when fluids were still entering the well at significant rates, have been corrected and give substantially the same value for permeability as the data collected during the next 45 hours during which the flow of fluids into the well bore was small.

Selecting Wells Which Will Respond to Production-Stimulation Treatments

Here is a new method of analyzing producing rate and pressure-buildup data, which permits direct measurement of the cause of low well productivity. When the cause of the low well productivity is known, it is possible to determine if stimulation is needed and the results to be expected from these treatments. The method of analysis presented uses only data collected during the first few hours after shut in. This makes the method practical, because a minimum loss of current income results while the well is shut in to collect the necessary data. Use of this method will increase the percentage of successful fracture treatments by eliminating treatment of wells in which there is little chance of increasing production significantly. Examples of actual well problems are given.

by
R. E. Gladfelter,
G. W. Tracy,
and L. E. Wilsey

DEVELOPMENT of hydraulic fracturing as a method of well stimulation has resulted in completion of many wells which otherwise would not be commercial. Also many wells which were almost ready to be abandoned have been rejuvenated and made profitable as a result of fracture treatment. Despite many successes, all fracture treatments are not profitable. Why some treatments are successful and others are not is not always clear.

Authors are with Stanolind Oil & Gas Co., Tulsa. From spring meeting, Mid-Continent A.P.I. Division of Production, Amarillo, 1955.

Making a productivity - stimulation treatment profitable can be divided into two phases: (1) Determine the reasons for unsatisfactory productivity; and (2) design and perform the required treatment. This paper deals with the first phase. It presents a method for determining reasons for unsatisfactory productivity and for predicting the results to be expected from stimulation treatment.

Low productivity in a well may be the result of any one or a combination of the following causes:

1. A severe permeability reduction may exist near the well bore. Because all fluids must flow through the formations adjacent to the well bore, a reduction in permeability here can result in a noncommercial well even though considerable recoverable oil still remains in a permeable reservoir. By removing this permeability block, a large increase in productivity will result. The spectacular results of wash treatments, relatively small-volume fracture treatments, and other similar treatments which affect only the reservoir rock near the well bore, are due to removing this permeability block.

2. There may be substantial recoverable oil in place but the formation permeability is so low that it cannot be recovered at economic rates by conventional completion methods. Large increases in recovery from reservoirs of this kind can be obtained by deeply penetrating fractures as suggested by Wilsey and Bearden.[1] Treatments of this kind are expensive and are not needed in more permeable formations.

3. Reservoir pressure has been depleted even in the interwell area, i.e., there is insufficient reservoir energy remaining to expel more oil. In this situation, present productivity-stimulation techniques will not result in sufficient sustained increased productivity to be profitable.

The key to the problem of what to try to do with a well in need of production stimulation is diagnosing which of these conditions is the cause of the particular well's undesirable productivity. Methods have been published for analyzing pressure-buildup data to determine the cause of low productivity. These methods require that wells being tested be shut in until the flow of fluids into the well bore is small compared to the producing rate prior to shut in. In some cases, shut-in periods for testing were far in excess of 48 hours. Economics often prohibit shutting in wells this long. Therefore, former methods of analysis were not entirely satisfactory. This paper presents a new method of analysis which does not require long shut-in periods (less than 48 hours) and, hence, makes **practical** the measurement of the cause of low productivity.

"If the condition ratio as defined in this paper is less than 1.0, a stimulation treatment which affects only the formation in the vicinity of the well bore can result in significant increases in productivity. If the condition ratio is greater than 1.0, treatments which only affect the formation near the well bore cannot be expected to be economically successful. However, if the condition ratio is greater than 1.0 and the formation permeability is low enough, as defined herein, substantial increases in productivity can result from deeply penetrating fractures or reservoir-fracturing treatments."

How to Recognize Reduction in Permeability Near the Well Bore

Many authors[2,3,4,5,6,7] have shown that the average permeability* of the drainage area of a well can be determined by analyzing the pressure-buildup behavior of a well when it is shut in. The average permeability of the reservoir, as measured by this method, is not affected by the permeability near the well. A permeability which is a combination of the permeability near the well bore and the average permeability in the drainage area can be measured by a productivity-index test.[7]

If a reduction in permeability exists near the well bore, the permeability determined from a productivity-index test will be lower than that measured from a pressure-buildup test. Thus, by taking a ratio of the permeabilities as determined from a productivity-index test (K_{PI}) and by a pressure-buildup test (K_{BU}), a reduction in permeability near the well bore can be detected. An expression indicating the flow conditions near the well can be written as condition ratio, $CR = (K_{PI}/K_{BU})$. When a permeability reduction exists near the well, this ratio will be less than 1. If an increase in effective permeability exists near the well bore, such as might result from an acid job or an earlier fracture treatment, the ratio will be larger than 1. Appendix I gives a step-by-step outline for calculating condition ratio.

Permeability from buildup tests . . . Unfortunately, in order to determine the average formation permeability from uncorrected buildup-test data, it is necessary to wait until the flow of fluids into the well bore, after the well was shut in, becomes small compared to the producing rate prior to shut in. This requirement does not introduce important difficulties in many high-productivity wells, but it does severely limit the application of the method in pumping wells. In many low-productivity pumping wells, significant flow into the well continues for a long time so that unreasonably long shut-in periods for gathering data are sometimes required to measure the permeability using well-test data. Thus low-productivity wells, which can least afford to be shut in for testing and where stimulation treatments can do the most good, require the most shut-in time. Consequently a study was begun in search of a practical way to determine average formation permeability in low-productivity wells. As a result of this study, it was found that this could be done by a simple adjustment of the measured pressure-buildup data. This adjustment is indicated by the expression:

$$\Delta P_n' = \Delta P_n \left[q_o/(q_o - q_n)\right] = m \log \delta_n \qquad (1)$$

where:

$\Delta P_n'$ = corrected buildup pressure (psi.)

ΔP_n = buildup pressure (psi.) = $(P_w - P_{DD})_n$ for each time interval

P_w = bottom-hole pressure at time δ_n (psia.)

P_{DD} = pressure just prior to buildup test (psia.)

q_o = producing rate prior to shut in

q_n = average flow rate between δ_n and δ_{n-1} (bbl./day)

δ_n = buildup time (hours)

$m = 162.5\ (q_o\mu\beta/Kh)$ = slope of buildup curve (psi./cycle)

K = average formation permeability (md.)

h = average formation thickness (ft.)

μ = oil viscosity at reservoir conditions (cp.)

β = reservoir volume factor of oil (ratio)

From inspection of Equation 1, it can be seen that the slope of the corrected buildup pressure vs. log shut-in time is directly related to the average formation permeability (K_{BU}) and that it can be determined by the following equation:

$$K_{BU} = \frac{0.1625\ q_o\mu\beta}{mh} \qquad (2)$$

Figs. 1 and 2 give examples where K_{BU} is calculated from buildup data measured during the first 5 hours after wells were shut in.

Permeability from productivity-index test . . . A permeability from productivity-index test can be measured by producing a well at as nearly a constant rate as possible for as long as possible or until the producing bottom-hole pressure has ceased to change significantly. Under these conditions, the combination permeability (interwell permeability plus well-bore effects) can be closely approximated by:

$$K_{PI} = \frac{q_o\mu\beta \ln (r_e/r_w)}{7.073\ h\ (P_s - P_{DD})} \qquad (3)$$

where:

r_e = effective radius of drainage (see appendix for selection of value)

r_w = well-bore radius

P_s = static reservoir pressure (psia.)

The recommended way to get the

*Actually the buildup-curve analysis yields $Kh/\mu\beta$, but the authors chose to use permeability K to describe this factor inasmuch as it introduces no error in this discussion and is commonly used in describing a formation.

WIGGINS DOUBLE PONTOON FLOATING ROOFS

Safest Storage for Your "Liquid Assets"

Performance records prove that Wiggins Double Pontoon Floating Roofs soon pay for themselves in liquid conserved. Only Wiggins Double Pontoon Floating Roofs have every important feature for maximum conservation . . . safest operation . . . low-cost maintenance.

Triple Seal increases conservation savings and adds extra safety.

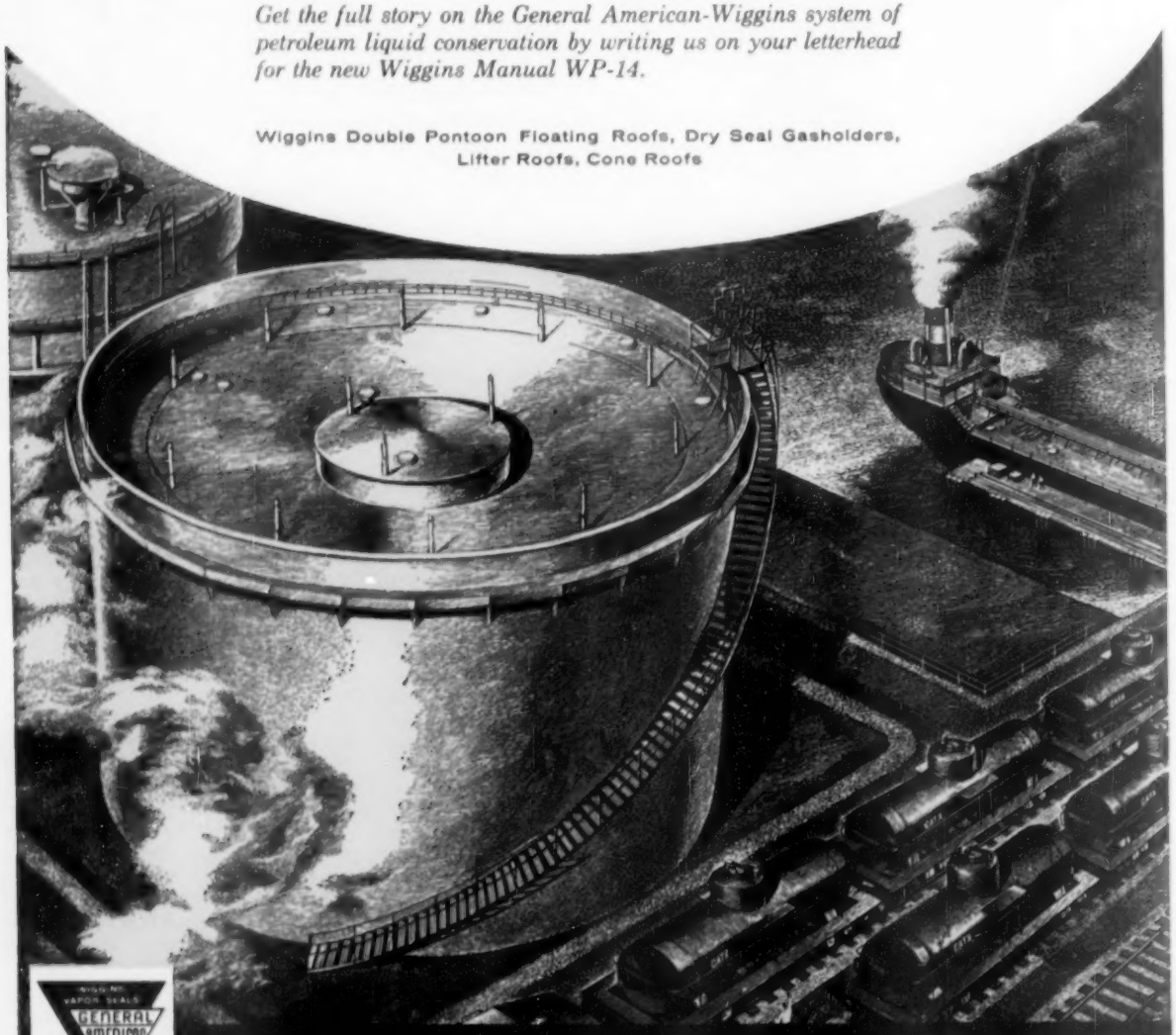
Multiple gas-tight pontoon compartments increase safety, strength and buoyancy.

Simplified design gives strength with minimum trussing, making inspection and maintenance easy.

Complete, clean drainage reduces corrosion problems.

Get the full story on the General American-Wiggins system of petroleum liquid conservation by writing us on your letterhead for the new Wiggins Manual WP-14.

Wiggins Double Pontoon Floating Roofs, Dry Seal Gasholders, Lifter Roofs, Cone Roofs



GENERAL AMERICAN TRANSPORTATION CORPORATION

135 SOUTH LA SALLE STREET · CHICAGO 90, ILLINOIS

static pressure, P_s, is to calculate it using pressure-buildup data and a method similar to that of Horner[2] and Matthews et al.[5] A modification of their method is necessary if pressure-buildup data collected just after the well is shut in are used. The observed pressures must be adjusted to allow for the flow of fluids into the well bore. This is done by plotting $\Delta P_s'$ from Equation 1 vs. log of $(T + \delta)/\delta$ and proceed as outlined by Horner.[6] The static reservoir pressure determined by this method may be in error a few pounds per square inch because of lack of specific information as to the shape of the well's drainage area, but the error will not be large enough to be significant in measuring condition ratio.

In highly permeable formations where a very large reduction in permeability adjacent to the well bore is responsible for a well's low productivity, it may be practical to measure the approximate static reservoir pressure by merely shutting in a well; but in many formations this cannot be done because of the long shut-in period required. The length of time required to obtain essentially static reservoir pressure varies depending on the following factors:

Factor	Effect
(a) Formation permeability and thickness.	(a) Longer for low permeability thin formations.
(b) Oil viscosity and rate of production prior to shut in.	(b) Longer for more viscous crudes and higher rates of production.
(c) Distance to the effective radius of drainage.	(c) Longer for large radius of drainage.
(d) Length of time since last shut in.	(d) Longer for long production time.

The rate of pressure buildup in a well may be very slow and yet the well-bore pressure be a long way from the static reservoir pressure.

Gross errors in estimating the static reservoir pressure can be made if it is assumed that the well-bore pressure has reached the static pressure because the change in well-bore pressure over a period of a few hours is less than the accuracy of the bottom-hole pressure measuring instrument. For this reason and because it is impractical to shut in wells for a long period of time in order to measure static pressure, the static pressure should be estimated by the method suggested above.

Low Productivity Due Solely to Low Formation Permeability

A well may not produce at attractive rates even though a high reservoir pressure exists and no reduction in permeability exists near the well bore. The low production rate may be caused by the reservoir being too tight to produce at attractive rates without some special stimulation such as reservoir fracturing, as proposed by Wilsey and Bearden,[3] and currently being practiced in some fields.

For the sake of brevity, all the combinations of formation and crude characteristics which require reservoir fracturing in order to result in the highest profit will not be discussed. However, all of these factors are reflected (in the same way that they affect recovery) in the slope of the buildup curve used to calculate the average permeability. Using the data of Wilsey and Bearden,[3] it was found that if the slope of the pressure-buildup curve is greater than about 50 psi. per cycle per barrel per day producing rate;* and if substantial reservoir pressure exists, a well will give a desirable response to a deeply penetrating or reservoir-fracturing treatment.

How to Tell When Reservoir Pressure Is Depleted

Analyzing a well's pressure-buildup data to get static pressure for use in determining condition ratio will show whether the reservoir has been depleted or not. If little reservoir pressure still exists, most of the primary oil has already been recovered and there is little point in stimulating this kind of well. Fracture treatments on wells in a low-pressure reservoir may result in a temporary increase in production rate, but the rate will soon decline and the stimulation treatment may not be an economic success.

*Buildup curve is plotted on semilog coordinates.

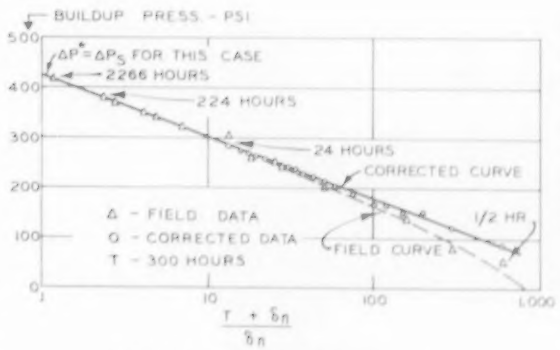


Fig. 3—Buildup pressure vs. Log $(T + \delta)/\delta$.

Increase in Productivity From a Stimulation Treatment

The increase in well productivity to be expected from a particular stimulation treatment can be found by comparing the condition ratio, CR, measured before the treatment with that which normally results from similar treatments. For example, if a condition ratio of 2 can be expected after a stimulation treatment and the condition ratio of a well is 0.2 before treatment, an increase of tenfold in stabilized producing rate can be expected to result from a stimulation treatment applied to this well.

The condition ratio which results from stimulation treatments such as oil squeezes, surfactant treatments, etc., can at best be 1.0. Condition ratios higher than 1.0 require that the reservoir rock undergo a physical change such as might result from dissolving part of the rock with acid or from rupturing the formation as in a fracture treatment. In formations of moderately high permeability, a condition ratio of 2.0 may be about as high as can be expected from ordinary stimulation treatments. In formations of low permeability, condition ratios much higher than this can result from fracture treatments, depending upon reservoir conditions. In low-permeability formations, condition ratios of about 5.0 are common. Despite this variation in condition ratio that can result from stimulation treatments, experience gained from measurement of condition ratio in a few wells in an area of interest which have been stimulated will provide information that will indicate what condition ratio can be expected. The use of condition ratio in estimating increases in productivity to be expected from a stimulation treatment is subject to errors in estimating what condition ratio will result from treatment, but removes the much more important error resulting from not knowing the well conditions before treatment. Thus, with a minimum of experience in an area, the increases in productivity which will result from a stimulation treatment can be predicted.

The estimation of "static reservoir pressure" from early pressure - buildup data is illustrated by Fig. 3. Data collected during the first 24 hours after shutting in the well were used to indicate the same "static" pressure as measured after 2,266 hours of shut in.

*$\Delta P_s'$ is plotted versus log of $(T + \delta)/\delta$ (where T is the time since last shut in). Fig. 3 gives an example where the static pressure is determined by this means. In Fig. 3, P^* is very nearly the same as the static pressure. This will not always be the case; refer to Horner[2] for details of how to get static pressure from P^*.

Appendix—Example Problem

To apply Equation 1 to field data, the following steps are suggested to facilitate the analysis of the data:

1. Plot on coordinate paper the actual field-measured bottom-hole pressure (psia.) vs. time in hours, and draw a **smooth** curve. This minimizes scatter resulting from errors of observation.

2. Plot the height of fluid column in the well vs. time on coordinate paper and draw a **smooth** curve. If reliable sonic fluid-level data cannot be taken because of foaming in the annulus, but both casing pressure and bottom-hole pressure were measured, it is necessary to calculate the height of the fluid column as it changes with time.

$$\text{Height of fluid} = \frac{\text{Bottom-hole pressure} - \text{casing pressure}}{\text{Fluid gradient}}$$

3. Read off values of bottom-hole pressure and fluid height from each of the curves in Steps 1 and 2 at 1-hour time intervals, starting at zero shut-in time, and tabulate these values. Time intervals less than or greater than 1 hour can be used depending on how fast the well builds up (Fig. 4).

4. Evaluate the rate of change, or rise, of the fluid column in feet per hour at each time interval, n. This is now q_n.

5. Convert the original producing rate, q_o, from barrels per day to feet of rise per hour in the casing annulus, i.e.:

$$q_o\,(\text{ft./hr.}) = q_o\,(\text{bbl./day}) \times \frac{1}{24\ (\text{casing annulus cap.,* bbl./ft.})}$$

6. Calculate $q_o - q_n$ at each successive interval, i.e., Step 5 minus Step 4, for each time interval.

7. Calculate $q_o/(q_o - q_n)$ at each successive interval, i.e., Step 5 divided by Step 6, at each time interval.

*If tubing and casing are equalized, use casing volume capacity minus tubing and rod-metal volume.

TABLE 1—SAMPLE CALCULATIONS FOR A TYPICAL WELL SHOWN IN FIG. 5

		Step 3	Step 3	Step 4	Step 6	Step 7	Step 8	Step 9	
Time interval	Buildup time	Fluid column height	BHP	Rate of change of fluid height			Field build-up pressure	Corrected buildup pressure	
n	δ_n (hr.)	h_n (ft.)	Pw_n (psi.)	$\Delta h/\Delta\delta_n$ (ft./hr.)	$q_o - q_n$ (ft./hr.)	$q_o/(q_o - q_n)$	ΔP_n (psi.)	$\Delta P_n'$ (psi.)	$(T+\delta_n)/\delta_n$
1	½	3,000	1,142	190	298	1.638	52	85	601
2	1	3,085	1,168	170	318	1.535	78	120	301
3	1½	3,163	1,190	156	322	1.516	100	152	201
4	2	3,215	1,207	104	384	1.271	117	149	151
5	2½	3,260	1,224	90	398	1.226	134	164	121
6	3	3,292	1,236	64	425	1.151	146	168	101
7	4	3,348	1,259	56	432	1.130	169	191	76
8	5	3,394	1,275	46	442	1.104	185	204	61
9	6	3,431	1,290	37	451	1.082	200	216	51
10	7	3,460	1,300	29	459	1.063	210	223	43.9
11	8	3,480	1,310	20	468	1.043	220	230	38.5
12	9	3,500	1,318	20	468	1.043	228	238	34.3
13	10	3,517	1,324	17	471	1.036	234	242	31
14	12	3,544	1,335	13.5	474	1.038	245	252	26
15	14	3,566	1,342	11	477	1.023	252	258	22.4
16	16	3,585	1,349	9.5	478	1.020	259	264	19.75
17	18	3,600	1,355	7.5	481	1.016	265	269	17.67
18	20	3,614	1,360	7.0	481	1.015	270	274	16
19	24	3,640	1,370	6.5	482	1.013	280	284	13.5

Step 5, $q_o = \dfrac{195.6\ \text{bbl./day}}{24 \times 0.0167\ \text{bbl./ft.}} = 488$ ft./hr.

Step 11, m = 118 psi/cycle from the slope of Fig. 5.
T = 300 hours, h = 100 ft.

The column headed $(T + \delta_n)/\delta_n$ is used in determining static reservoir pressure. (See Fig. 3).

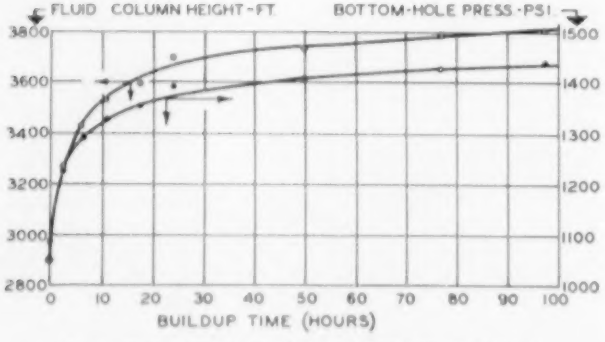


Fig. 4—Steps 1 and 2, initial plot of field data, Well No. 1.

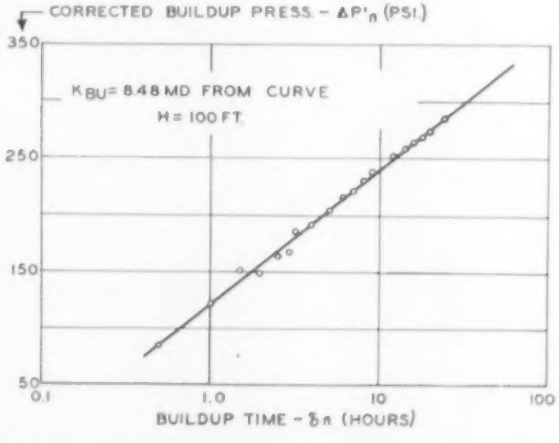


Fig. 5—Corrected buildup pressure vs. buildup time, Step 10, Well No. 1.

8. Subtract the bottom-hole pressure at zero shut-in time from each of the values of the bottom-hole pressure at each of the time intervals, i.e., values as read in Step 3. This gives ΔP_n, the buildup pressure as a function of buildup time, δ_n.

9. Multiply Step 7 by Step 8, i.e., $[q_o/(q_o - q_n)]\,\Delta P_n$, for each successive time interval, which will give the corrected buildup pressure, $\Delta P_n'$, as a function of buildup time.

10. Plot $\Delta P_n'$, Step 9, vs. the log of shut-in time, δ_n, i.e., $\Delta P_n'$ vs. δ_n on semilog paper.

11. Measure the slope of this curve, Step 10, in psi. per cycle. This will give the value of m to use in obtaining K_{BU}.

12. Calculate K_{BU} using Equation 2 and the value of m just obtained in Step 11.

13. The condition ratio can be calculated by dividing the K_{PI} (md) from a P.I. test, Equation 3, by the K_{BU} from building data, Step 12; i.e., condition ratio $= K_{PI}/K_{BU}$.

To illustrate how to apply the above scheme of correction of buildup data, an analysis was made of a typical well. Steps 1 and 2 are shown in Fig. 4, where bottom-hole pressure and fluid height are plotted vs. time.

Steps 3 through 9 are shown in Table 1, which is a detailed treatment of the actual field data. In this particular case, ½-hour time intervals were used for the first 3 hours. Step 10 is shown in Fig. 5, where $\Delta P_n'$ is plotted vs. the logarithm of δ_n.

Step 11, m, as measured from the slope of Fig. 5, is indicated at the bottom of Table 1. Step 12 is the value of K_{BU} and is shown in Fig. 5.

It is not necessary that 1-hour time intervals be used as prescribed in Step 3; this was only a guide which is flexible. Actually, for some wells the initial time intervals may be as small as 20 minutes, and for others as much as 1 hour. This depends upon the rate of buildup and the accuracy that is obtained in measuring the fluid rise. It is possible that the first few corrected points will be somewhat scattered. An example of this is shown by the Δ-point of Fig. 1. By increasing the length of the initial time intervals from 10 to 20 minutes, this scattering was appreciably reduced as shown by the points of Fig. 1. This scattering nature is the result of the inaccuracies of the data over very short time intervals initially, as well as applying this stepwise solution to the process of continuous flow into the well.

Some Sources of Errors in Analysis

Some mistakes might be made in calculating CR, and these will be briefly discussed.

In order to compute both K_{PI} and K_{BU}, values of q_o, μ, β, and h were assumed. Fortunately, any errors in estimating or measuring their quantities cancel out, provided the same value is used in both the calculation of K_{PI} and K_{BU}.

In calculating K_{PI}, the value substituted for $\ln(r_e/r_w)$ may be significantly in error if only a short test is run because it is not possible to know r_e/r_w precisely. However, if the production rate has been settled for a period of several days or weeks prior to measuring P_{DD}, this number can be fairly closely approximated by ln (2 × average distance to offset wells). The effect of not producing the well long enough when measuring productivity index is to cause a condition ratio, CR, to be calculated which is too high.

Caution should be used in the analysis of pumping wells which have the casing open to the flow lines. This sometimes causes foaming of the oil in the annulus.

Advantage of Early Interpretation

Proper evaluation of buildup data requires that well-bore pressure be plotted against the logarithm of shut-in time. The properties of a logarithmic scale are that the distance between 1 and 10 on a log scale is the same as between 10 and 100, or 100 and 1,000, etc. This means that in the interpretation of buildup data the slope can be determined with as much accuracy (assuming pressure measurements are accurate) between 1 and 48 hours as it can between 48 and 2,200 hours. Therefore, being able to analyze the first 48 hours of pressure-buildup history will permit much more accurate determination of slope.

There are at least three additional big advantages to analyzing early data:

1. The most obvious one is that current income need not be lost in determination of the condition ratio.

2. Interference from offset wells will not obscure the true slope. Interference causes the slope during the late stages of a buildup test to be too flat. Failure to recognize interference causes an erroneously high interwell permeability, K, to be estimated. This in turn causes the calculated well condition ratio to be too low. An error of this kind might conceivably result in a well being treated to stimulate production which had little chance of success.

3. The pressure changes so slowly during the latter stages of a buildup test that small errors in pressure measurements can completely obscure the correct slope of the buildup curve.

Disadvantages of Using Early Buildup Data

If a well has been fractured with a large volume treatment so that the fracture extends farther than the transient has reached by the end of the buildup test, an erroneous value for K_{BU}, which is too high, will be measured. The length of time it takes for a transient test to indicate conditions beyond the end of the fracture depends on the oil in place per acre and the permeability. It is beyond the scope of this paper to discuss this matter in detail.

Estimation of Condition Ratio in Injection Wells

Although it is not intended to discuss all the uses of pressure transient tests (buildup tests in producing wells and pressure fall-off in injection wells), it should be realized that the same methods of analysis used to calculate condition ratio, CR, are equally applicable to injection wells. The rates, q, and direction of pressure changes, ΔP, are both reversed but no change in the method of analysis is necessary.

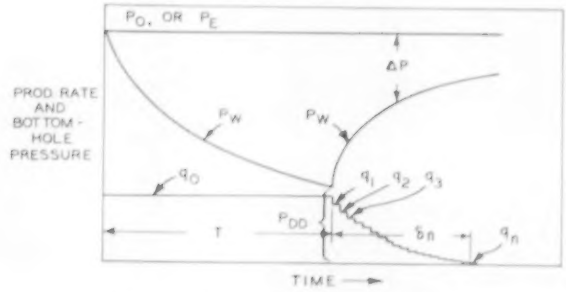


Fig. 6—Hypothetical pressure behavior.

References

1. Wilsey, L. E., and Bearden, William G., "Reservoir Fracturing—A Method of Oil Recovery From Extremely Low Permeability Formations," A.I.M.E. Pet. Tech., Aug. 1954.

2. Horner, D. R., "Pressure Buildup in Wells," Proceedings, Third World Petroleum Congress, Sec. II, E. J. Brill, Leiden (1951). Abs., The Oil and Gas Journal, May 31, 1951, p. 99.

3. Platt, George, "A Study of Transient Pressure Behavior in Porous Media," master's thesis, University of Tulsa, 1952.

4. Van Everdingen, A. F., and Hurst, W., "The Application of the LaPlace Transformation to Flow Problems in Reservoirs," Trans. A.I.M.E. (1949), Vol. 186, pp. 305-324. Abs. The Oil and Gas Journal, Feb. 24, 1949, p. 166.

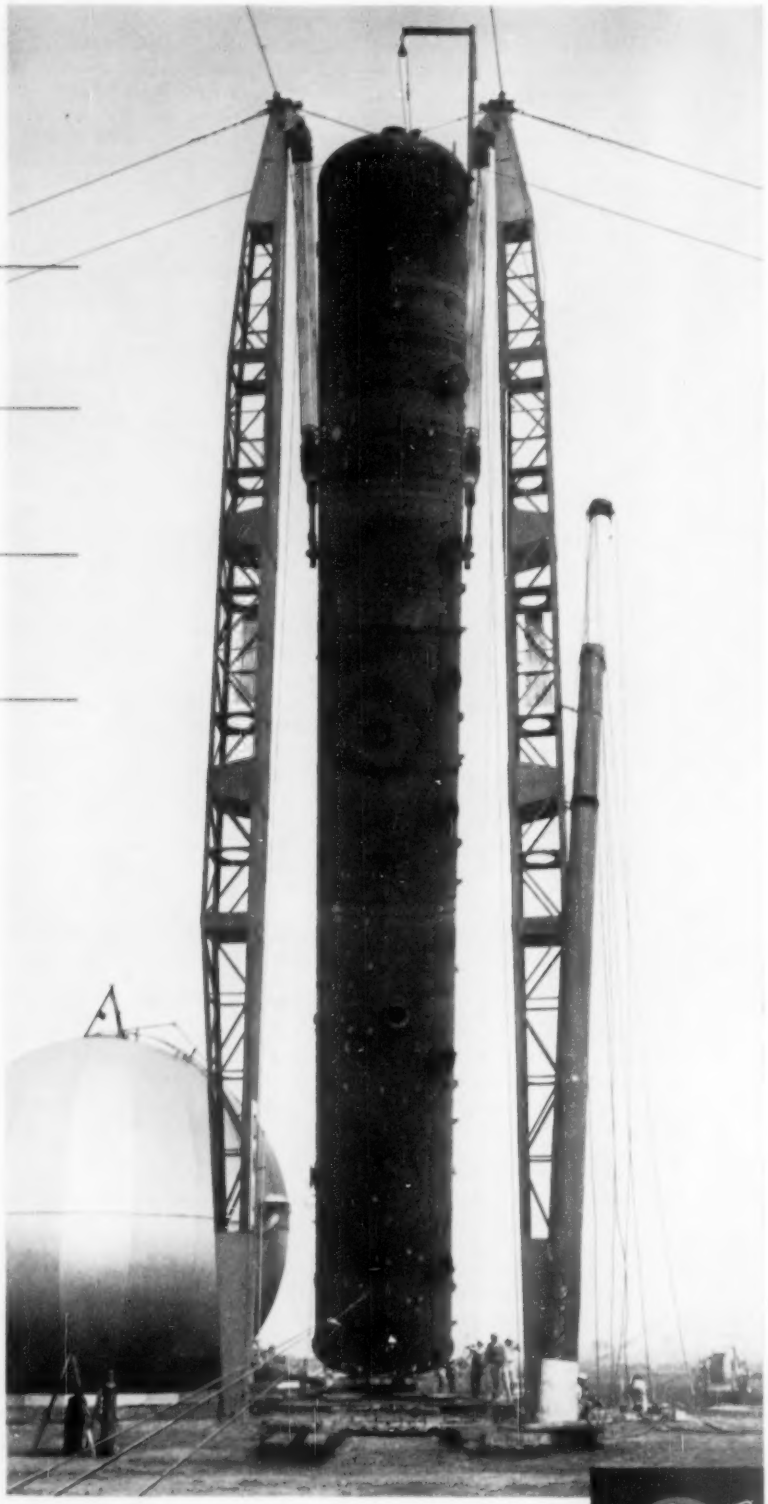
5. Matthews, C. S.; Brons, F.; and Hazebroek, P., "A Method for Determination of Average Pressure in a Bounded Reservoir," Trans. A.I.M.E. (1954), Vol. 6, p. 35.

6. Jacob, C. E., A.G.U. Transactions, Part II, 1940.

7. Miller, C. C.; Dyes, A. B.; and Hutchinson, C. A., Jr., "Estimation of Permeability and Reservoir Pressure From Bottom-Hole Pressure Buildup Characteristics," A.I.M.E. Transactions, Vol. 189 (1950).

Raising depropanizer column at El Segundo. Setting this 114 ft. vessel required watch-like precision in handling a 35 ton load.

Up Goes The Octane Rating



CHEVRON Detergent Action GASOLINES

To help meet the pressing demand for high powered quality motor fuels, the Standard Oil Company of California recently put two new 22,000 barrels-per-day Catalytic Reforming Plants into production.

Located at the company's refineries in Richmond and El Segundo, California, the plants are important components of Standard's long-range refinery expansion program. Both were completed ahead of schedule.

Bechtel did the detail design, engineering, procurement and construction. Every function required for a complete refinery or an individual plant is available promptly—under single responsibility.

BECHTEL

BECHTEL CORPORATION

BUILDERS FOR INDUSTRIES

Los Angeles • **SAN FRANCISCO** • *New York*

CANADIAN BECHTEL LIMITED • **Toronto**

Maintaining Slush-Pump Fluid Ends—1

MORE than two-thirds of all of the horsepower hours used in rotary drilling go to the pumps. Furthermore, advances in jet drilling are making pump operation more and more important. When one considers the tremendous amount of work done by the slush pumps and the character of the fluid pumped, it is easy to understand the importance of correctly selecting and maintaining the expendable fluid-end parts. A well-planned and executed program can materially reduce drilling costs.

The service life of the expendable pump parts shown in Fig. 1 depends not only on proper selection and maintenance of the parts, but also on good pump installation and operation.

Pump Installation

Suction manifold . . . Modern slush pumps are built to put tremendous hydraulic power down the hole. But they still depend (except where suction-charging pumps are used) on nature's few pounds of atmospheric pressure to fill the cylinders. Filling problems become more acute with higher piston velocities.

Incomplete filling of the cylinder can result in hammering and in destructive pressure peaks, shortening the life of fluid-end parts as well as the pump itself. Sometimes lack of filling takes place while the piston is accelerating during the early part of the stroke. Then the fluid finally overtakes and slaps the piston as it slows down toward the end of the stroke. Under other conditions, the fluid may fail to overtake the piston during the suction stroke. Then the piston reverses direction and attains considerable velocity on the discharge stroke before striking the solid fluid abruptly.

A considerable portion of the available atmospheric pressure (which is 14.7 psi. at sea level and less at higher altitudes) is required to overcome the inherent fluid friction in even the best pump designs. As much as 5 to 10 psi. can be lost through the valve and seat alone. This leaves only a few pounds to lift the mud from the level of the pit and to overcome the friction and the inertia of the mud column in the suction pipe. Fig. 2 shows an ideal suction arrangement with least friction and low inertia.

About ½-psi. pressure is required for each foot of suction lift. The modern trend is toward the elimination of depressed pits, wherever possible, and the use of tanks to give positive head on the suction.

Factors contributing to excessive suction-pipe friction are a sharp-ended intake connection, a suction strainer, small-diameter suction pipe, long runs of suction pipe, suction hose with torn lining, and numerous fittings.

In a typical suction manifold, a good suction entrance (as shown in Fig. 2) can reduce friction equal to 30 ft. of pipe. The friction through a mitered elbow or a 90° turn through a tee can be equal to that of 35 ft. of pipe. Even a long sweep elbow can equal the friction of 8 ft. of pipe.

The inertia problem, which is even more important than the friction, is easily understood when one remembers that the mud column must have a variable velocity to match the suction demand. It must therefore be speeded up and slowed down four times for each suction stroke for each revolution of the pump.

Minimizing this inerta effect requires both a reduction of the velocity of the mud column and a reduction of its weight. These two conflicting requirements must be comprised between a large diameter and a short length.

When desirable suction conditions cannot be gotten otherwise, a charging pump is necessary. However, this is not always an easy solution to the inertia problem.

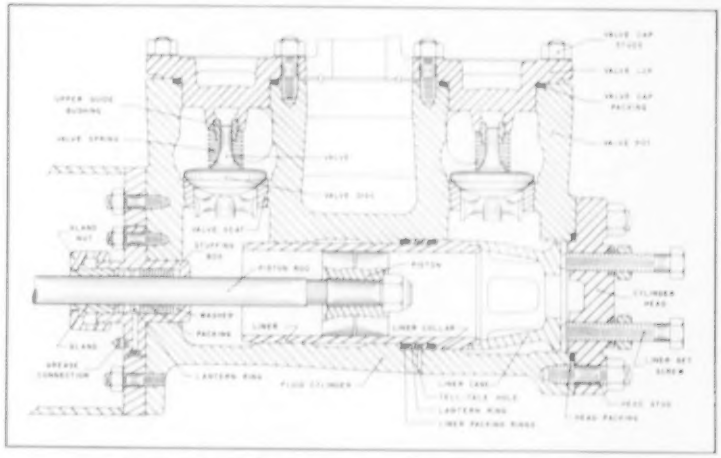


Fig. 1—The vital parts of a typical slush-pump fluid end.

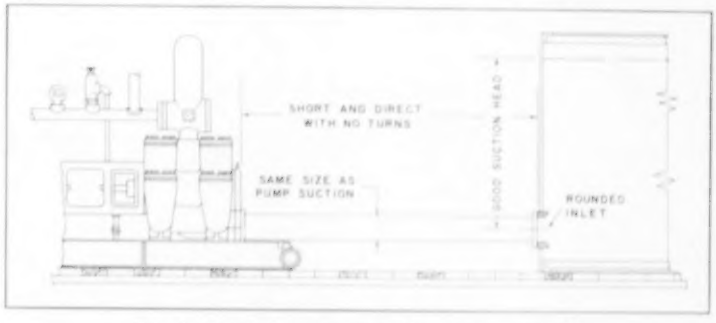
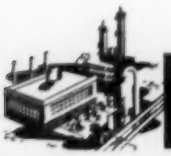


Fig. 2—An ideal arrangement of a suction manifold.

This material taken from Tool Pusher's Manual, A.A.O.D.C.



THE FOREMAN'S PAGE

Refining • Petrochem • Natural Gasoline

JOB IMPROVEMENT FOR THE PROCESS FOREMAN—5

Let's Look at Pressure, Specific Gravity, and Density

Q. What happens to gas when we subject it to pressure?

A. As has been stated, gas has great compressibility. When compressed and released, it immediately returns to its former state. So great is this property that if it is not enclosed in a container, the gas will mix with outside gases and is soon lost. This property makes air a useful material for filling footballs, air cushions, automobile tires, etc., and as a medium for transferring energy.

An Irishman named Robert Boyle set forth the principle that at a constant temperature, the volume of gas varies with the pressure. That is, if a volume of gas be reduced by pressure to one-half its volume, the pressure of the gas will be doubled. On the other hand, if the volume of the gas be let into a container of twice the size or, in other words, the volume be doubled, the pressure is only one-half as much as originally.

Thus, if a quantity of gas with a pressure of say 20 psi. must be reduced to 1/10 the space, it must be remembered that the pressure will be 10 times as much, or 200 psi.

This principle has many valuable uses in our refinery. It is necessary to know the strength of boilers, gas containers, pipelines, etc., in order to know how much a gas may be compressed with safety. A small oxygen cylinder contains 220 cu. ft. of oxygen under 1,800 lb. pressure. That means that the oxygen in the cylinder would occupy 220 cu. ft. at atmospheric pressure of 14.7 psi.

Q. What is specific gravity?

A. The specific gravity of a substance is the ratio of the weight of a given volume of this substance at 60° F. to the weight of the same volume of water at 60° F.

Q. How did the present method of expressing specific gravity evolve?

A. Before the turn of the century, it was decided in industry that the specific gravity scale, as such, was unwieldy to use. Especially for products lighter than water where the specific gravity might be a number such as 0.9971. What was needed was a greatly expanded scale which would magnify the difference in gravities between products of nearly the same weight and replace the decimal numbers with whole, easily remembered numbers. To accomplish this, the Baume scale for liquids lighter than water was devised. And several other scales were made up and used. Then, a few years later, a different Baume scale for liquids heavier than water was devised.

This variety of scales led to great confusion among hydrometer manufacturers in particular and the industry in general.

So, in 1921, the American Petroleum Institute, the U. S. Bureau of Mines, and the U. S. Bureau of Standards agreed on a new scale to be used by everyone in the petroleum industry. This scale, the A.P.I. scale, is now in universal use in the petroleum industry. The relation of degrees A.P.I. to specific gravity is expressed by the formula

$$\text{Degrees A.P.I.} = \frac{141.5}{\text{Sp. gr. at } 60^\circ/60^\circ \text{ F.}^*} - 131.5$$

Q. What's the easiest way to determine specific gravity?

A. The most common and handiest method of determining gravity (A.P.I. or specific) is the use of a hydrometer. A second method which is used for viscous liquids or solids is the specific-gravity bottle or pyonometer.

A law of physics known as Archimedes' Principle states that "a body immersed in a fluid will be buoyed up by a force equal to the weight of the fluid displaced." As applied to refinery use, this might be stated as "a hydrometer immersed in a liquid will sink until the volume of liquid displaced by the hydrometer weighs the same as the hydrometer." The range of a hydrometer is determined largely by the amount of lead shot put in it.

Q. What is "gas specific gravity"?

A. In refinery use, gas specific gravity is the ratio of the weight of a given volume of a gas to the weight of the same volume of air at the same conditions of temperature and pressure. Equal volumes of different gases, under the same conditions of temperature and pressure, contain the same number of molecules (at moderate temperatures and pressures). Hence, the specific gravity of a gas can also be determined by the following formula:

$$\text{Sp. gr. of a gas} = \frac{\text{Molecular wt. of gas}}{\text{Molecular wt. of air}}$$

The molecular weight of air is 28.97. The molecular weight of a gas, if the formula is known, can be determined. For example: Butane (C_4H_{10}) has a molecular weight of $4 \times 12 + 10 \times 1$, or 58. The gas specific gravity of butane is 58/28.97, or 2. The liquid specific gravity of butane is 0.584.

Q. What do we mean by the density of a substance?

A. The density of a substance is its weight in pounds per cubic foot. Density and specific gravity can be mutually converted if it is remembered that water has a specific gravity of 1 and a density of 62.4 lb. per cu. ft. For example, the liquid specific gravity of butane is given as 0.584. What is the weight (density) of butane in pounds per cubic foot? In pounds per barrel?

0.584×62.4 is **36.47** lb. per cu. ft.; there are 5.61 cu. ft. in a 42-gal. barrel, so 36.47×5.61 is **204.6** lb. of liquid butane per barrel.

Similar calculations can be run on the substances listed in Table 1.

TABLE 1

Substance	Sp. gr.	Gas, sp. gr.	A.P.I. gravity	Density, lb. per cu. ft.
Air		1.00		0.076
Ethane	0.377	1.04		23.52
Butane	0.584	2.00	110.6	36.47
Gasoline	0.7201		65.0	44.93
Gas-oil	0.8762		30.0	54.67
Fuel oil	0.9725		14.0	60.68
Ethyl alcohol	0.8100		36.7	50.50
Water	1.0000		10.0	62.39
Mercury	13.60			850

Material taken from training program notes, Esso Standard Oil Co., Baton Rouge, La., refinery.

*The specific gravity of oil at 60° F. as referred to water at 60° F.

by
Dr. R. F. Nielsen

ENGINEERING FUNDAMENTALS

Analyzing "Viscous Fingering"

IN displacing a liquid in a porous medium by one having a much lower viscosity, a phenomenon called "viscous fingering" is often encountered. This has, for instance, been reported as occurring in laboratory experiments involving long cores.

The complete mathematical analysis of the problem has not yet been found. Qualitatively speaking, the displacing liquid finds paths (capillaries) of least resistance. And, because of its low viscosity, it "fingers" rapidly into these channels.

To show how this may take place, some problems will be worked out for two sets of parallel capillaries of different diameters. It will be assumed that there is no intercommunication except at the ends.

For convenience in deriving equations, the bundle of capillaries will be treated as a porous medium. Consider a liquid of viscosity μ_2 being displaced by a liquid of viscosity μ_1 in a linear system of length L (Fig. 1). At some time the interface has traveled a distance x, at which the pressure is p_x, the pressures being p_1 and p_2 at the upstream and downstream ends, respectively.

Darcy's law gives for the two sections

$$q = kA\,(p_1 - p_x)/\mu_1 x \qquad (1)$$

$$q = kA\,(p_x - p_2)/\mu_2 (L - x) \qquad (2)$$

where q is the flow rate, k the permeability, and A the cross-sectional area in the usual units.

The assumption of the same value of k behind and ahead of the interface corresponds to complete displacement in the capillaries. Clearing fractions and adding gives

$$kA(p_1 - p_2) = q[\mu_1 x + \mu_2 (L - x)] \qquad (3)$$

The rate of movement of the interface, dx/dt, is q/f, where f is the porosity. Substituting f dx/dt for q and integrating gives the time required for the interface to move a distance X:

$$t = \frac{\frac{1}{2}(\mu_1 - \mu_2)X^2 + \mu_2 LX}{kf(p_1 - p_2)} \qquad (4)$$

If there is a capillary pressure drop across the interface, this must be added to or subtracted from the value of $p_1 - p_2$, depending on whether its direction is that of helping or hindering the flow. If the displacing fluid is the wetting fluid, the capillary pressure must be added. And if the displacing fluid is the nonwetting fluid, the capillary pressure must be subtracted.

Several sets of calculations have been made applying Equation 4 to two parallel noncommunicating layers, one of which has twice the permeability of the other. The location of the interface in each layer at certain definite times was calculated. The results are shown in Fig. 2.

Fig. 2a is for the case of the displacing fluid having 1/20 the viscosity of the displaced fluid, with the capillarity pressure negligible compared to the imposed pressure drop. The entering fluid of low viscosity travels relatively more and more rapidly in the layer of high permeability.

Fig. 2b is for the same conditions except that the capillary pressure is in the direction of helping the flow. The imposed pressure drop was taken as 3 units. The capillary pressure was taken as 5 for the higher permeability and 7 for lower, since the ratio is the inverse square root of the permeability ratio. The respective denominators of Equation 4 are therefore in the ratio $2(3 + 5)/(3 + 7) = 8/5$. It is apparent that the fingering is more pronounced when (1) the imposed pressure drop is high compared to the capillary pressure, and (2) if the entering fluid is the wetting fluid, less viscous than the displaced fluid.

Fig. 2c is for the case of the displacing fluid having 20 times the viscosity of the displaced fluid. Comparison with 2a shows that fingering is suppressed when the entering fluid has a relatively high viscosity.

Fig. 2d was calculated on the assumption that the entering and more viscous fluid was nonwetting to the solid. The capillary pressure was again taken as 5 and 7, respectively, for the two layers. And the imposed pressure drop was taken as 11. The respective denominators in Equation 4 are then in the ratio $2(11 - 5)/(11 - 7) = 3$.

With the entering fluid having the higher viscosity and being the nonwetting fluid, the fingering is apparently lessened by increasing the imposed pressure drop.

Fingering is often much more pronounced than shown in Fig. 2. This may be because of greater variation in capillary sizes than that assumed here.

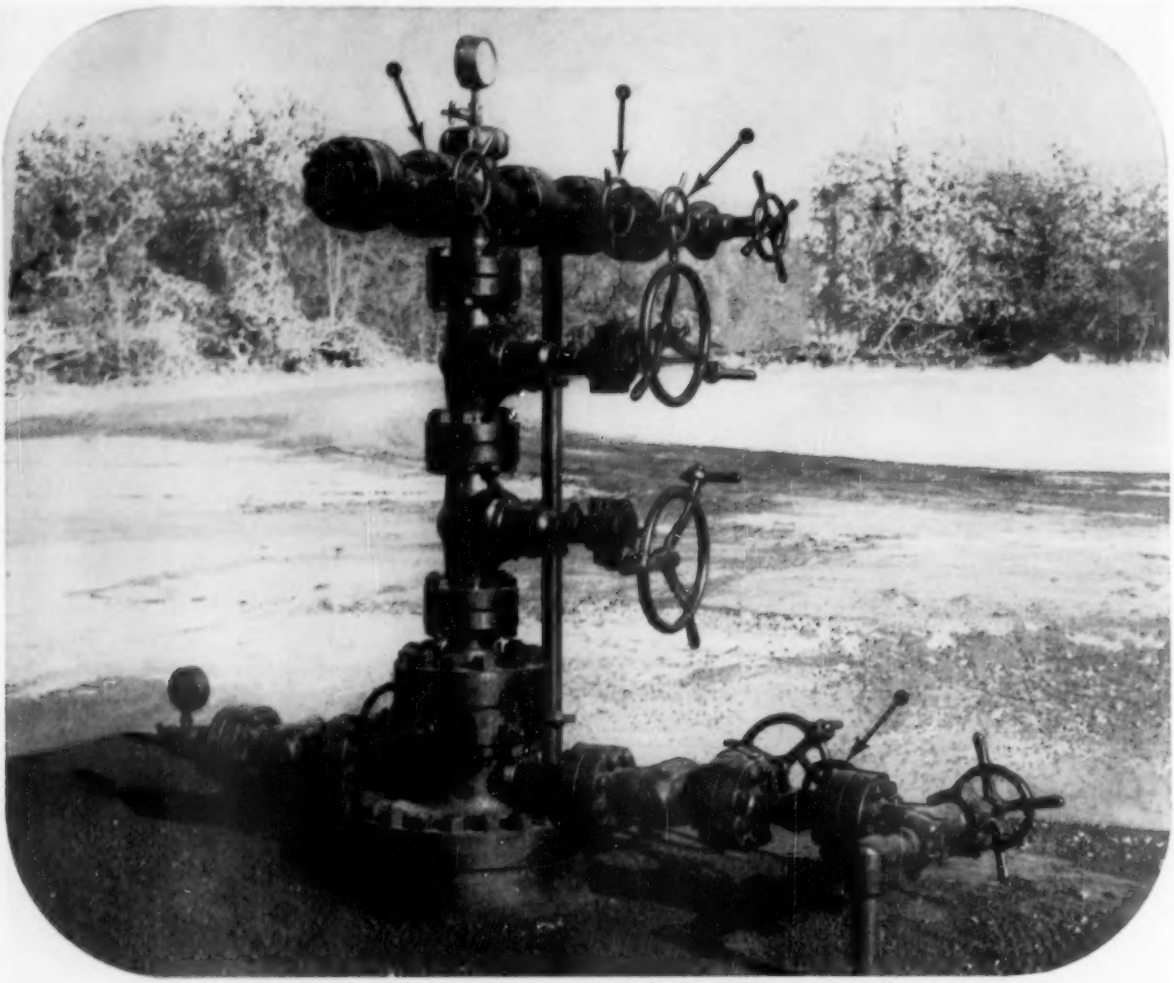
References

1. Jones-Parra, Stahl, and Calhoun; Bull. 62, Min. Ind. Exp. Sta.; Penn. State U., 1953.
2. Engelberts and Klinkenberg, Third World Petr. Congress, 1951.

Fig. 1—Illustrating the derivation of Equation 4.

Fig. 2—Advancement of the oil-water interface at various times in two noncommunicating parallel linear layers of different permeabilities. (M.R. = Mobility Ratio = viscosity ratio, displacing to displaced fluid.)

Author is associate professor of petroleum and natural-gas engineering, Pennsylvania State University.



Sure way to avoid Flowdowns

You can't use more economical valves in your production operations than Orbit forged steel Production Valves. They are designed and built for continuous heavy duty service.

Maintenance is reduced to a minimum, even in the roughest service, because the Orbit principle of seating does not require a lubricant to shut-off pressure.

Opening and closing operations are short and easy. Lubrication is only occasionally required, and then but at two points, to insure positive, easy, and fast action at all times.

The owner of the above 10,000 pound test surface installation has further availed himself of the savings Orbit provides by using four Orbit Venturi Type 2" x 1" wing valves instead of four full opening 2" valves on the tubing wings. A total savings to operator, in this instance, of $605.00.

Orbit manufactures a full line of forged steel Production Valves, from 1" to 4"; working pressures starting at 500 pounds Maximum Service Pressure Rating, to and including 5,000 pounds Maximum Service Pressure Rating, both *carbon* trim and *stainless* trim.

Orbit forged steel Production Valves are available through your favorite Well Head manufacturer.

ORBIT VALVES ®

There is only one ORBIT VALVE

ORBIT VALVE COMPANY

P. O. BOX 699 TULSA, OKLAHOMA

by W. L. Nelson
Technical Editor

QUESTIONS ON TECHNOLOGY

What's the Value of a Degree in Gravity?

"There is much talk now about the price of crude oil and the 2-cent per degree difference in price for each degree A.P.I. One schedule in Oklahoma now uses a 3-cent differential. What has been the practice? Is the 2-cent differential a proper one?"—S.W.M.

Ideas of the value of a degree A.P.I. in a crude oil have varied widely throughout the years and in different sections of the country. This is, of course, logical because basically the "differential" should be a function of the relative prices of gasoline (or light oils) and residues. During 1903-1954, the prices of crude oil in the Mid-Continent area involved differentials ranging from zero (or sometimes two flat prices) to as high as 10 cents per degree A.P.I. (N.P.N., October 26, 1921, page 54):

April 1900-October 16, 1903—flat price.

October 17, 1903-November 6, 1904—two flat prices.

November 7, 1904-March 8, 1905—5-cent differential per half degree.

March 9, 1905-May 26, 1905—flat price above 30° A.P.I.

May 27, 1905-June 29, 1907—5-cent differential per half degree (30°-32° A.P.I.).

June 30, 1909-September 19, 1910—two flat prices.

September 20, 1910-November 22, 1922—single flat price.

November 22, 1922 to date—2-cent differential.

Although the 2-cent differential has been in practice in Mid-Continent area since 1922, in most Texas areas since about 1930, and in West Texas since 1936, the situation in other areas has often called for larger differentials. This is indicated in Table I which shows differentials as high as 9° for some California oils (in some ranges of gravity). The ratio of gasoline to Bunker C prices is also indicated in Table I for three regions and in general, the high ratios correspond to the high differentials.

Although a 2-cent differential fairly well represented the relative values of crude oils from 1930 to 1948 (average differential about 1.8 cents per degree A.P.I.), since that date the price of Bunker C fuel oil has been so relatively low that the proper differential is about 3.5 cents per degree A.P.I. No real relief from low residual fuel prices is in sight and accordingly, it is believed that proper crude-oil differentials will remain in the range of 3.5-4.0 and will perhaps increase to 4.0-4.5 during the next few years. Whether or not this will be reflected in the differentials used in posted price schedules remains to be seen, because somewhat the same general effect can be gained by the posting of new schedules for low-gravity crude oils at a lower price level.

What Are Multigrade Lubes?

"What are the multigrade lubes mentioned in so many articles?"—H.R.G.

Much attention has recently been directed toward lubricating oils of extremely high viscosity index. The grade referred to in "multigrade" is the conventional S.A.E. classification. A multigrade oil can meet the requirements of several S.A.E. grades. Thus, an S.A.E. 10W-30 oil is one that meets the low-viscosity requirements of S.A.E. 10W oil at low temperatures and the viscosity requirements of S.A.E. 30 oil at high temperatures. Such an oil would not meet the requirements of an S.A.E. 20 oil but would meet the requirements for S.A.E. 20W.

Multigrade oils are especially suitable for stop-and-start driving, permitting better mileage, less wear, lower octane gasoline, and a cleaner engine, it is said.

TABLE I—AN INDICATION OF THE PRICE DIFFERENTIALS PER DEGREE A.P.I. USED IN THE UNITED STATES AT VARIOUS TIMES

(Cents per degree A.P.I.)*

						Ratio of gasoline to Bunker C prices‖		
	Mid-Continent	Various Texas areas	West Texas	California†	Wyoming and Montana (heavy)	Gulf cargoes	Los Angeles area	Midwestern
1922	2							
1925-1926	2	10 & 8						
1926	2		5			3.36		
1927	2	5, 3, 4, & 2	5, 4, 3, & 2			2.53		
1928	2	7, 5, 3, & 2	Flat			4.59		
1929	2		4			4.84		
1929-1930	2	2	4 & 3					
1930	2	2	3 & 2			4.3		
1931-1935	2	2	Flat			2.5-4.66		
1936	2	2	2			3.02		
1942	2	2	2	2 to 4‡		2.83 (3.0)	3.38 (4.02)	
1943	2	2	2	2 to 4‡		2.34	2.78	
1945	2	2	2	2 to 4‡	2½	2.46	2.76	2.55
1946	2	2	2	0 to 4‡	2½	2.05	2.54	2.29
1947	2	2	2	0 to 5‡	2 & 2½	1.8 (1.44)	2.64 (2.29)	2.42 (1.62)
1948	2	2	2			1.57 (1.14)	2.47 (2.24)	1.88 (1.74)
1949	2	2	2	2 to 13‡	2 to 6	2.8 (3.20)	2.97 (3.32)	3.76 (4.67)
1950	2	2	2		2 to 6	2.64 (2.86)	3.33 (3.90)	2.73 (2.83)
1951	2	2	2		2 to 6	2.52	2.9	2.57
1952	2	2	2		2 to 6	2.70 (2.95)	2.9 (3.36)	1.62 (3.80)
April 1954	2	2	2	4 to 9‡	2 to 6	2.42 (2.73)	3.35 (3.64)	3.52 (4.34)

*The actual units were not always "cents per degree" being sometimes stated as "cents per ½ degree," "cents per 3 degrees," etc. †Only Coalinga, Huntington Beach, Wilmington, Kern River, and Kern Front fields. ‡Differential varies from crude oil to crude oil and it also varies within each price schedule. In some ranges of the schedules the differential may even be zero. §Proportional (not equal) to a proper differential for crude oils during these years. Approximately proper differentials are indicated in parenthesis.

UNDERGROUND STORAGE—1

What's Behind Today's Storage Trend?

by N. E. van Fossan

THIS series will be primarily devoted to the washed-type solution cavern developed in salt formations.

● If the L.P.G. industry is to continue its rapid rate of expansion, the problems of large-scale storage must be solved. Large-scale storage is necessary in the producing areas, in export staging areas, in marketing areas (to support large numbers of distributors), and to a lesser extent in distributors' bulk storage.

● In the past, emphasis has been placed on storage at the point of production, but present trends are to expansion of marketing storage. Economics of tank-car movements require continuous utilization of fleets, and this can only be accomplished by enough storage remote from the source of supply. Marketing storage or in-transit marketing storage fills this need.

● One of the most practical and economical methods of storage is underground in washed caverns developed by the solution removal of salt from subterranean beds.

● Salt is available in sufficient quantity to support storage projects at production centers of West Texas, Oklahoma, Kansas, and the Gulf Coast; in the staging areas of the Gulf of Mexico and Great Lakes; and in some of the marketing centers of Michigan, Ohio, New York, Mexico, Europe, Asia, and the Far East.

Salt has been laid down during various geological ages from the Silurian until recent times. Salt bodies of different latitudes though of the same geological age, will have different physical characteristics.

Author is with Texas Natural Gasoline Corp., Tulsa. Paper presented at thirty-fourth annual meeting, N.G.A.A. at Dallas, April 13-15, 1955.

What factors are important? The characteristics of salt bodies which affect their utilization in the development of safe, economical underground storage are as follows:

1. Depth below surface level.
2. Thickness of the salt sections.
3. Solubility of the salt deposited and the characteristic of the insoluble stringer system laid down in the same evaporative process.
4. Foreign materials laid down, over, within, or under the salt mass.

Several other factors are of equal importance:

1. Geographic location of the salt mass to service-required areas.
2. Adequate supplies of fresh water to remove the salt by solution in sufficient quantity and rate.
3. A method of disposal of the brine thus produced.
4. Drilling, maintenance, and workover costs within the range of economic reality.

Different areas—different problems . . . It is most necessary that individual study be given to the possible problems that will be encountered in various areas. For example: Gulf Coast dome drilling, Permian basin, Michigan basin, Paradox domes, and Syracuse beds. Each present different problems.

This paper is not an attempt to lay down a solution to those problems. Rather, it is intended as a warning to unwary operators that such problems do exist. It attempts to acquaint the reader with pertinent facts concerning salt bodies and general conditions to be expected in the different salt areas. It hopes to give the operator enough information to make a detailed investigation of his specific locality.

Who started it? . . . There have been many fathers of the underground-storage idea. Letters of patent were issued to a German in 1919 which read in part: " . . . the storage of petroleum and related hydrocarbons takes place in underground cavities . . . these are hollowed out in strata which are such that they provide walls which are impervious, homogeneous, and free of cracks—as, for instance, rock-salt beds . . ."

The first usable solution-cavity-type underground storage was developed by the Texas Natural Gasoline Corp. in the Permian salt beds of Upton County, West Texas. The well was drilled in the late part of 1949 and was initially washed to 50,000 bbl.

Brine disposal . . . First the operator must decide where the storage is wanted, and then he must investigate and available containing media. It must first be established that no contaminants are contained therein, (namely sulfur, hydrocarbon residues, hydrogen sulfide, etc.). Continuous media must be of sufficient thickness to render unit cost of developed volume economically practical. It must have sufficient overburden to give static pressures at the cavity ceiling in excess of the contained or operating pressures of the cavity. Finally, it must have proper capping formations to permit an acceptable washing procedure.

Two major items are now injected into the problem: (1) obtaining fresh wash water in sufficient supply to develop the proposed storage section; and (2) adequate, economical methods of disposing of brine produced as a result of this development. Water may be obtained from drilled water wells, rivers or lakes, and the ocean.

DRY INSTRUMENT AIR—10

Humble's Dry-Air System Proves Its Worth

by R. L. Dockendorff

IN this concluding installment of the series on Humble's Baytown instrument-air system, let's take a look at operating experience and costs.

Extraneous connections . . . One of the real problems with the central system — particularly one retaining components from earlier facilities— is protecting the system from misuse. Process foreman in all areas and utilities-distribution foreman thoroughly policed the Baytown system to find and dismantle all extraneous connections into the dry-air system at the time it was put into operation. Still, years later, an extraneous connection occasionally is found which was either overlooked initially, or has been added later without the knowledge of the utilities department.

Some time ago, a 1-in. steam line, wide open, was found connected into the dry-instrument-air header. It took several days after the disconnection for the system to dry out. There are perennial requests for permission to use the dry air for everything from comfort conditioning to tank blowing. It has required a clear policy and firm, centralized control to keep the situation in hand. Despite slipups here and there, the system has provided dry air when it was important and freezeups have been eliminated in the areas served by the central system.

Costs

A summary of the actual investment in 1947-48 on the central system is given in Table 1. In Table 2 you'll find the investments in subsequent years to increase the capacity of the system to 3,400 standard cu. ft. per minute of dry air and to make it available to all the units.

While this adds up to an investment of only $33 per standard cubic foot per minute, a considerably higher figure, about $85 per standard cubic foot per minute, should be considered for the total cost of the present facilities. This is because the distribution lines earlier in use were incorporated into the central dry-air system, and because compressed air at 100 psig. was diverted from existing compressors.

After more than 6 years of use, it is apparent that Baytown's central system is here to stay. After correcting initial difficulties, a relatively stable and satisfactory operation has been established. One expansion to two-fold capacity already has been made at Air Station No. 2 as more processing units have been added. There is little reason for further delay in extending a main header the rest of the way to the group of units formerly known as the toluene plant.

The favorable evidence is not lacking: during a freeze in 1951, the toluene plant units and several process units at the nearby Government-owned rubber plants were largely shut down due to icing. But the balance of the refinery process units were unaffected. Most of the auxiliary devices provided with the original job have been retained, notably the low-pressure-actuated cutins. Headers have been extended to new units.

Author is with the engineering division, Humble Oil & Refining Co., Baytown, Tex. Paper presented at Texas A. & M. process instrumentation symposium at College Station, Tex., January 25-28, 1955.

Acknowledgments

Thanks are due the Humble Oil & Refining Co. for permission to present information concerning the dry-air facilities at its Baytown refinery. Assistance in assembling of facts was provided by several coworkers at Baytown, including E. J. Pratt, E. L. Ekholm, C. W. Bates, W. H. Fortney, and H. C. Lyles.

References

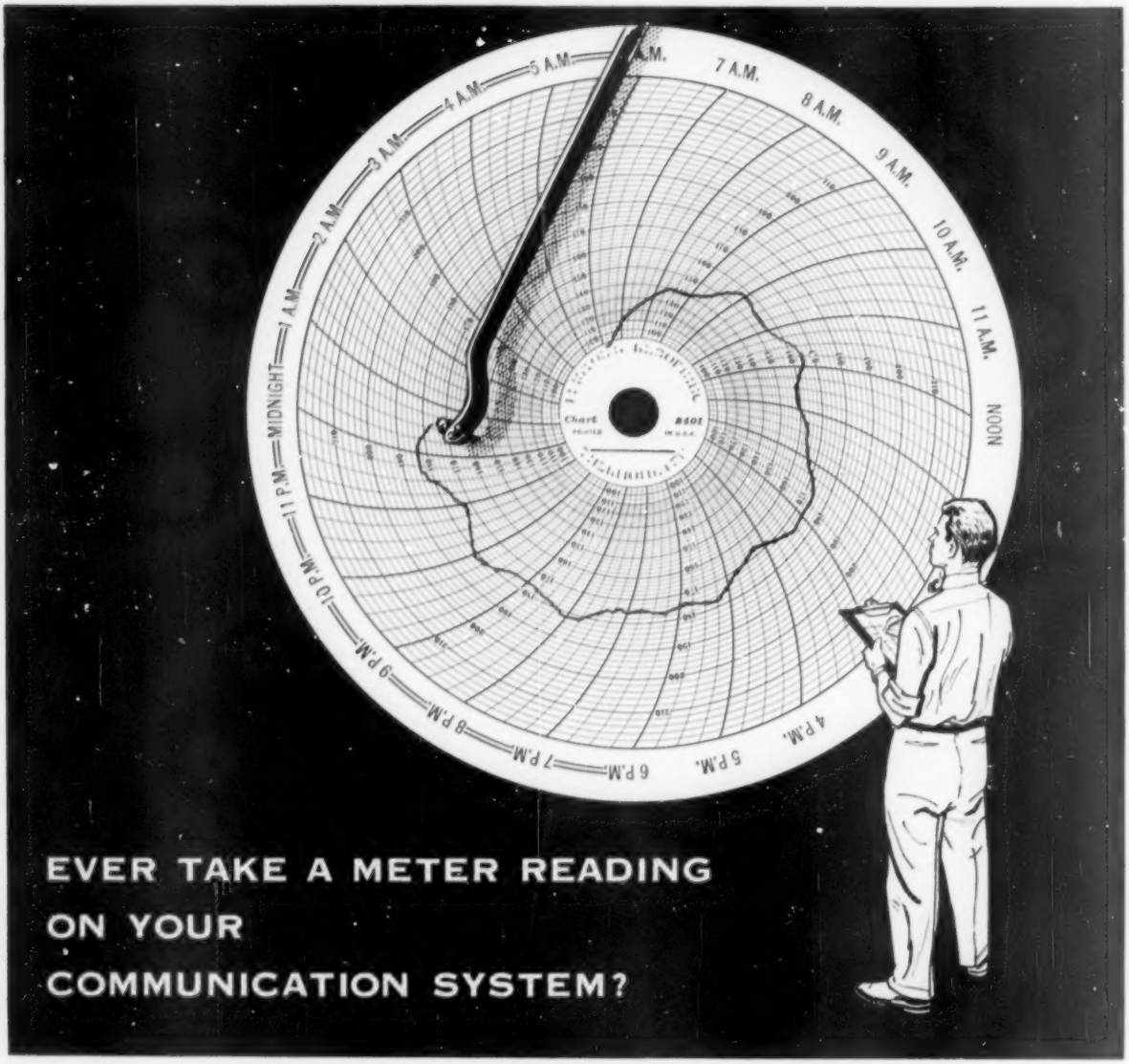
1. Ludi, W. C., Petroleum Refiner, 25-10:478 (1946).
2. Amero, Moore, and Capell; C.E.P. 43:349 (1947).
3. Campbell and Lawrence; Pet. Ref. 31-8:65 (1952).
4. Campbell, Skinner, and Lawrence; Pet. Ref. 31-10:106 (1952).
5. Eagleton and Bliss; C.E.P. 49:543 (1953).
6. Jury and Licht; C.E.P. 48:102 (1952).
7. Taylor, R. K.; I.E.C. 37:649 (1945).
8. Chem. Eng. Handbook, J. H. Perry, Third Edition, pp. 880, 912.
9. Private communication, Aluminum Co. of America.
10. Derr, R. B.; I.E.C. 30:384 (1938).
11. Hougen and Watson; C.E.P. 43:197 (1947).

TABLE 1—SUMMARY OF APPROPRIATION CLOSEOUT COSTS, 1948 INSTALLATION

Item—	Cost
One 1,500-lb. twin-cell dryer unit, with oil filter, dust filter, utilities supply, and foundations	$10,000
One 2,500-lb. twin-cell dryer unit, with oil filter, dust filter, utilities supply, and foundations	13,900
Flow instruments and pressure-control valves	4,300
Piping, including new galvanized-steel headers throughout the plant, laterals to operating units, and air-piping changes at operating units	30,800
Total initial investment in new facilities	$59,000

TABLE 2—SUMMARY OF CAPITAL ADDITIONS TO DRY-AIR SYSTEM SINCE 1948

Item—	Cost
Two dew-point recorders and alarms at the two dryer stations	$1,500
Replacement of galvanized-steel heating coils in both dryers with Type 347 finned coils	13,300
Install additional air coolers to precede dryers, two units of 540 sq. ft. each, with admiralty tubes and carbon-steel shells	6,800
Additional lines to new units	8,700
Second 2,500-lb. twin-cell dryer at Air Station No. 2, with oil and dust filters, instruments, foundations, and piping connections; dryers equipped with Type-304 heating coils; instruments include a dew-point recorder	22,900
Total supplementary investment	$53,200



Bell System communication engineers will help you take a good, close look at your communication system . . . *at no cost to you.*

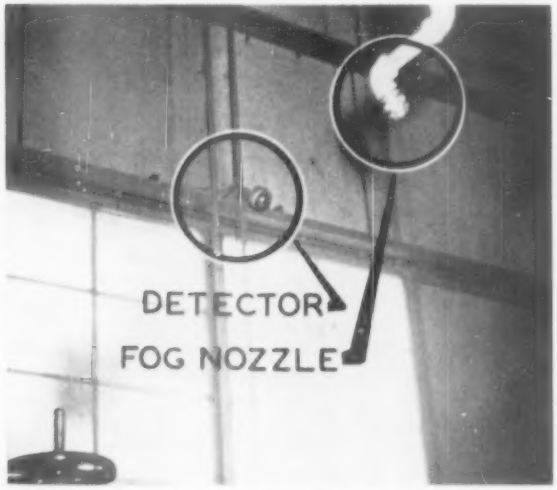
Your Bell Telephone Company will make a comprehensive survey to help you get the best use of your facilities . . . local exchange, long distance, mobile, teletypewriter, metering and supervisory control . . . all the communications you use.

These surveys include recommendations to give your operation the best communications at the lowest possible costs. Many companies have changed, rearranged or added services or facilities on the basis of these surveys.

• **If you are interested in a Bell System communication survey without charge, call your local Bell Telephone representative now.**

BELL TELEPHONE SYSTEM

TELEPHONE TELETYPEWRITER MOBILE RADIO TELEMETERING AND REMOTE CONTROL CHANNELS



IN ALL VITAL AREAS of the station, this combination of infra-red-sensitive detectors and fog sprays protects against fire.

THE DETECTORS are rugged photo-conductive cells that filter out sunlight or artificial light but not the flicker of a flame.

Automatic fire protection

here's how it was achieved at two remote California gas-turbine stations

by E. E. Taylor and L. J. Fast

AUTOMATIC fire-protection systems have been installed in two gas-turbine stations in the desert west of Blythe, Calif. Remoteness of the stations required an elaborate automatic-shutdown and water-spray fire system. In case of fire, a new type of infrared-sensitive detectors trigger a system which blankets the station with fog spray.

Authors are with Southern California Gas Co. and Southern Counties Gas Co., respectively. Condensation of a paper presented at the Pacific Coast Gas Association, Gas Supply and Transmission Conference, Palm Springs, Calif., May 2-3, 1955.

The stations are on tie 30-in. pipeline system which transports gas from the Arizona-California border into the Los Angeles area. The system is jointly owned by Southern California Gas Co. and Southern Counties Gas Co. The stations, Desert Center and Cactus City, are respectively 45 miles and 76 miles west of the main station at Blythe. Each station has a 5,700-hp. gas turbine driving a centrifugal compressor.

CACTUS CITY COMPRESSOR STATION showing how facilities were separated. Note compressor and transmission piping outside the building.

In designing the plants, consideration was given to the need for separating facilities. The main transmission line, the main control valves, and the by-pass and metering facilities are all located away from the main compressor building. No actual transmission lines enter the main building; the main compressor is located outside. The main turbine, accessory engines, shop, control panel, etc., are inside the building.

The combustion air ducts to the turbine enter the building through a closed-off area or basement section of the main floor, just under the main turbine.

Basic considerations . . . In the early study on what and how much fire protection would be required, first consideration was given to the peculiar location of the stations. Both are so remotely located that it would be almost impossible to get outside help in case of fire. Water scarcity at these desert locations called for the most conservative use of available water and use

AREA COVERED BY MAP

PIPE LINES AND OFFICIAL OIL AND GAS FIELDS OF THE ROCKY MOUNTAIN AREA

SHOWS: Crude Oil, Gasoline and Natural Gas Pipe Lines with pipe sizes. Refineries with capacity barrels crude per day. Oil fields in green, gas fields in red with official field names. Cities, towns, townships and ranges. Pipe lines and refineries in State of Kansas are not shown. Sketch above shows actual area covered by map.

SIZE: 78" wide by 84" high.
SCALE: 1" equals 12 miles.

PRICES:

Blue line on linen $135.00

Blue line on linen attached to heavy spring roller in dust proof steel map case 3" diameter by 87" long, silver finish, where map case hangs on wall and map rolls up and down like a curtain $160.00

E. C. JACOBSON MAPS

Phone 2-1952 315 Mayo Bldg.
Tulsa 3, Oklahoma

Eliminate Costly PARAFFIN Removal Methods with . . .

BrakeSol

HOLDS PARAFFIN IN SUSPENSION

from FORMATION to REFINERY

BRAKESOL is ECONOMICAL, prevents or removes Paraffin from the tubing, flow lines, tank bottoms and pipe lines. Effective on both asphalt and mixed base paraffin.

BRAKESOL is SAFE, won't harm skin; fire hazard is minimized. Sold only through supply stores. Complete service supplied by our Sales Engineers. Contact your local supply store.

WRITE FOR FREE DESCRIPTIVE FOLDER

BRAKESOL, Inc.

P. O. Box 9506 Oklahoma City 18, Okla.

PIPELINE PATROL

of some other fire-control medium to supplement or replace water.

Normally only one man is on duty at each station. In an emergency, everything would have to be handled by this man. He would have to make operating adjustments, close or open necessary valves, notify Blythe as to what was happening, and in addition, actuate fire-fighting facilities. Considering that this lone employe might be incapacitated by whatever happened, it became obvious that some automatic shutdown and automatic fire-control facilities would be essential in an emergency.

Lubrication system hazards . . . Probably the most serious potential fire hazard concerns the lubrication oil for the main-turbine bearings. A break in one of these pressured oil lines would probably spray oil over most of the building interior. And if this oil contacted a hot enough surface, the whole area might be enveloped by flame fed by oil under pressure.

The average flash point of ordinary lubricating oil is about 535° F. and the ignition point above 783° F. But some lube oil used for turbines has a flash point of only 400° F. and an ignition point of only 700° F. Some exposed surfaces on the turbine may reach a temperature of 1,450° F.

The small lines leading to gages, meters, etc., in the control room are another potential hazard. Many of these lines carry gas under various pressures up to 700 psi. A break in one, if ignited, would produce a torch flame that could melt through larger piping, etc., in a very short time.

Early station fire . . . Several months after regular operation started, there was a mechanical failure in the gear box driving the oil pump, generator, etc., on one of the turbines. Lubricating oil sprayed into the engine room and duct room, igniting upon contacting the hot duct surfaces.

The resulting fire impressively demonstrated what could happen if a high-pressure seal oil or small gage line ever failed.

In light of the above facts, each turbine station was equipped with a completely automatic fire-detection and control system. The heart of each system is the equipment designed by the Fireye Division of Electronics Corporation of America. It consists of a network of sensitive detectors and amplifiers.

Seven detectors for triggering the system are located in strategic spots. The fire system at each station is divided into two areas:

1. Detection and control of fires in the turbine room.

2. Detection and control of fires in the compressor and duct-room areas.

Sequence of events . . . The following events would happen in case of a fire in the duct-room area underneath the turbine:

1. A few seconds after the fire starts, the system detects flames.

2. The plant emergency-shutdown system is tripped. This shuts down the turbine and blows down the station piping.

3. The emergency fire pump starts.

4. An alarm horn sounds.

5. A radio alarm is transmitted to Blythe and Indio.

6. The foundation ventilation fan is turned off.

Sixty seconds after a fire is detected, water is sprayed from the fog heads in the duct room and compressor areas only. This time delay allows the station operator to try to extinguish the fire. If he can put the fire out within the delay period, no water will be sprayed. If he cannot, a solenoid-controlled master valve opens on the water system and water is sprayed through the fog nozzles.

At the end of a 3-minute period, a timing device closes the water valve. The water pump will then shut down unless the detectors are still "seeing" flame, in which case the attempted shutdown of water is overridden.

Electronic equipment . . . The heart of the system is a miniature, rugged, photo-conductive cell developed specifically for the job. The detectors indicate, by very rapid resistance changes, the varying amounts of infrared radiation emitted by a flame. They detect the flicker which distinguishes flame from a constant radiation.

Varying radiation from a flame causes a pulsating signal to be sent from the detectors to the amplifiers. The latter, being frequency-sensitive to this signal, actuate a system of relays.

Radiation from other sources, such as the sun, incandescent lamps, etc., is rejected by filters within the control panel which only pass pulses between about 6 and 30 cycles per second. In addition, discrimination against visible light is obtained by an optical filter cover over the cell which passes only infrared radiation.

The detector does not have to "see" the flame directly to set off the alarm, since most materials readily reflect infrared radiation.

Pump and spray equipment . . . The fire pump consists of a 52-hp. turbine

driving a centrifugal pump with a 400-g.p.m. capacity at 150-psi. discharge pressure. The turbine is essentially a steam turbine adapted to operate on natural gas at 150 psi., exhausting to atmosphere.

The fire-pump suction is on a 52,500-gal. - working - capacity water - storage tank. At the maximum rate of 400 g.p.m. our supply is good for at least 2½ hours.

Water damage to turbine . . . In designing the water-fog installation used around the turbine, we recognized that hot portions of the equipment could be damaged as a result of water cooling. However, this system differs materially from conventional protection, both in the quantity of water discharged per head, and in the positioning of those heads that are near the turbine.

A conventional sprinkler system discharges water at the rate of 0.25 to 0.4 gal. per sq. ft. And the water drops are very large in comparison with the particles discharged by fog systems. Fog heads of 15 gal. per minute capacity spaced at 12-ft. intervals, will deliver about one-third the rate of a conventional sprinkler system. The minute water drops of the fog system and their dispersion throughout the turbine room will essentially nullify the likelihood of damage through distortion of hot metal.

The fog heads close to the hot machinery are set to discharge away from the hot surfaces. The velocity of the discharged fog is such that it tends to pull flames into the spray pattern. The hot gases are so intermingled with water that the intensity of the fire is greatly or completely reduced.

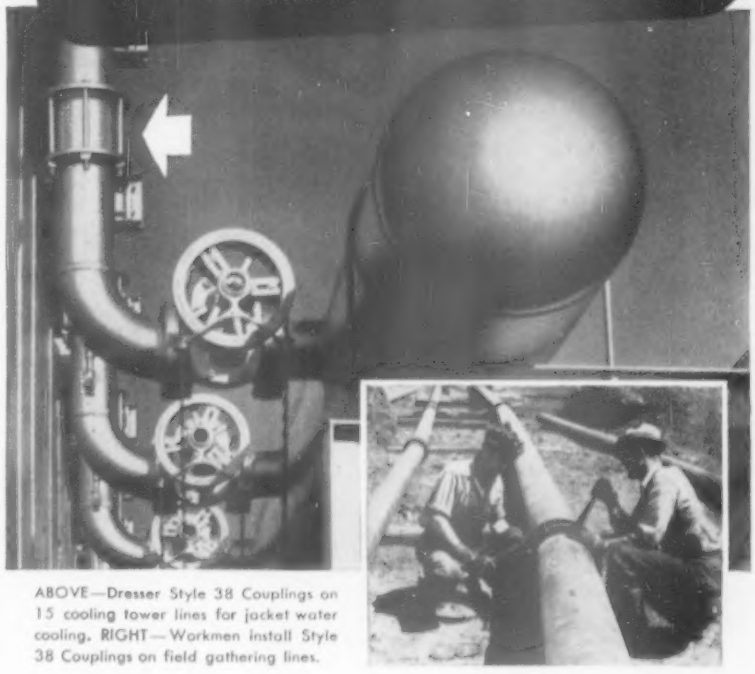
Alarms . . . Since there is only one man normally in attendance at each station, we felt it advisable to design alarms into our system in case he became incapacitated. Also, that these alarms should be received at a point where there was around-the-clock attendance. Our Blythe compressor station is the nearest point fulfilling this requirement.

At the Indio base the radio-alarm facilities end as an alarm buzzer in the housing of the supervisors.

The alarms are actuated by the fire-detection amplifiers through our own system of relays. The radio alarms last only 30 to 60 seconds so that emergency communications as a result of a fire will not be unduly hampered.

To our knowledge, these fire-protection systems are the only ones of their kind located in compressor stations on a gas-transmission system. The systems were designed on a consultant basis by Stanley D. Clithero of the General Petroleum Corp.

around a cooling tower...
the DRESSER way
is easier...surer!



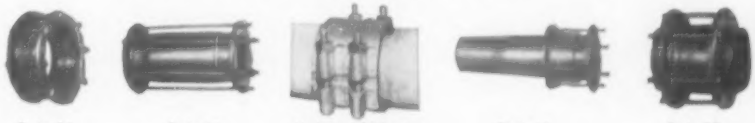
ABOVE—Dresser Style 38 Couplings on 15 cooling tower lines for jacket water cooling. RIGHT—Workmen install Style 38 Couplings on field gathering lines.

Anywhere you're joining pipe, the handiest, surest way to get bottle-tight joints is with Dresser Couplings or Long Sleeves.

Dresser Couplings provide the "give and take" necessary to absorb vibration, settlement and other stresses. Specially compounded rubber gaskets permit up to 4° deflection at joints—yet with Dresser Couplings, these joints stay permanently tight.

The only tool you need is a wrench—no pipe threading is necessary. Any workman can install Dresser Couplings, averaging only two man-minutes per bolt.

AVAILABLE AT LEADING OILFIELD SUPPLY STORES



Style 38 Coupling | Style 40 Long Sleeve | Hydrepair*Asbestos Cement Pipe Clamp | Style 63 Expansion Joint | Style 39 Insulating Coupling

*HYDREPAIR is a trade-mark of Dresser Manufacturing Division

DRESSER®

Dresser Manufacturing Division, 49 Fisher Ave., Bradford, Pa. (One of the Dresser Industries).
Warehouses: 1121 Rothwell St., Houston, Texas; 101 S. Airport Blvd., S. San Francisco, Calif.

"detour, davey

—you can't beat an

HC Smith

ROCK BIT

at making
fast, straight,
full gauge hole!"

-every bit
as good as
the best

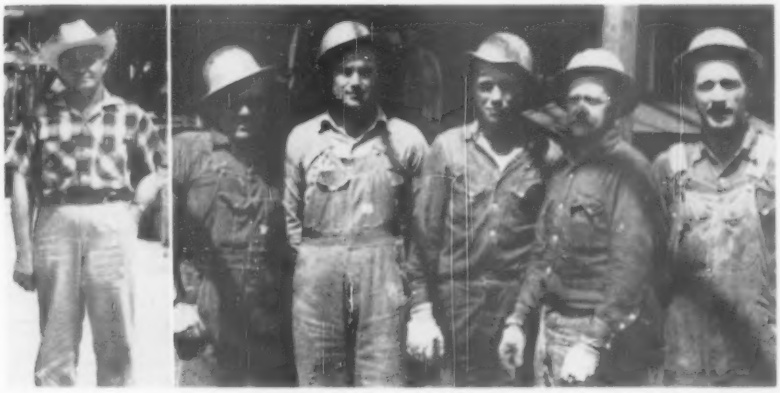
HC Smith
OIL TOOL CO.

GENERAL OFFICES, EXPORT OFFICES
AND PLANT: COMPTON, CALIF.

BRANCHES IN ALL PRINCIPAL OIL CENTERS
IN THE UNITED STATES AND CANADA

Among the

Drilling Contractors



Deep Drillers—J. C. Beard (left), tool pusher; and (right) day-tour crew on a large rig Rowan Drilling Co., of Fort Worth, has under contract to Houston Oil Co. in the 15,000-ft. Puckett Ellenburger field, in Pecos County, West Texas. Crewmen are, left to right: John Williams, driller; G. T. Bruno, derrickman; C. L. Cline, engine man; U. L. Tomlinson and P. K. Smith, floormen.

Harrell Drilling Co., Houston, has a rig working for General Crude Oil Co., of Houston, in the Aldine area, north of Houston, in Harris County, Texas Gulf Coast. The rig now is on 1 Hahl, west offset to the operator's recently completed gas-condensate discovery well (1 Hamans) in sand at 7,267-72 ft. The new test is permitted to 7,800 ft.

Arrow Drilling Co., Tulsa, has contracted for a 6,000-ft. Knox dolomite test to be drilled for L. E. Salmon in Pontotoc County, northeastern Mississippi, in the Black Warrior basin. Arrow will use a rig now on a wildcat test being drilled for Seaboard Oil Co. in Scott County, in the central part of the state. Location of the new test, 1 Andrews, is about 2 miles west of Friendship, in 3-9s-2e.

D. E. Vasser, Natchez, Miss., has taken on a contract for a rank wildcat test in northwestern Mississippi. Location is in northern Sunflower County, in the vicinity of Dockery, 40 miles northeast of Greenville. The test, 1 Dockery, in 4-21n-4w, is scheduled for 5,500 ft. It will be drilled for Latex-Gulf Oil Co. Nearest production is in Carey and Tinsley fields, about 65 miles to the south.

Greyhound Drilling Co., Shreveport, has a rig under assignment to David Crow, also of Shreveport, for a 6,200-ft. test on the east side of Kiblah field, in southern Miller County, Arkansas. Location is on the operator's Tisdale lease, in 8-20s-26w. Lowest objective is the Rodessa-Mitchell sand, productive in West Bradley field, about ¾ mile northeast.

J. B. Fletcher Drilling Co. is working for Byrd Oil Corp. at 1 Hammons, a newly started Tuscaloosa test in Lamar field, Franklin County, North Louisiana. Location is in 33-16n-9e. Objective is about 5,200 ft.

Barnwell Drilling Co., Shreveport, has two new jobs in Bethany field, northeast Texas. One is for M. M. Argo, in Harrison County, and the other for Barnwell & Kinzler, in Panola County. The first, 1 Rhodes, in the B. Luma Survey, is 4 miles southwest of Elysian Fields. The other, 2 Williams, in the William English Survey, is 3½ miles south of DeBerry. Both are listed as 6,500-ft. tests.

Glen Drilling Co., Tulsa, has a rig working for Sinclair Oil & Gas Co. at a wildcat location 3¼ miles south of Fouke field, in Miller County, southern Arkansas. Drilling is set up to go to 5,600 ft. Location is for 1 Evans, in 20-17s-26w.

Kern-Trimble Drilling Co., Magnolia, Ark., is drilling on the first of two 4,500-ft. Rodessa wildcat tests it has contracted to drill for Vernon Taylor, Jr., of Denver, in the Genoa-Boyd-Texarkana area, of Miller County, southern Arkansas. Rig is drilling at 1 Harrell, in 26-16s-28w, 2½ miles southwest of Boyd, and about 5½

CUT *shop expense*

Cut shop expense on your drill collars by using 'Bestolife Lead Seal. Because of its high percentage of powdered metallic lead, 'Bestolife is heavy enough to stay on threads and shoulders instead of being squeezed out. This gives you extra tight leak-free joints, which are easy to break out. That's why 'Bestolife is first choice with tool pushers all over the world. See your local supply store for 'Bestolife. In 1¼, 5, 20 and 50 lb. cans. Unconditionally guaranteed.

I. H. GRANCELL

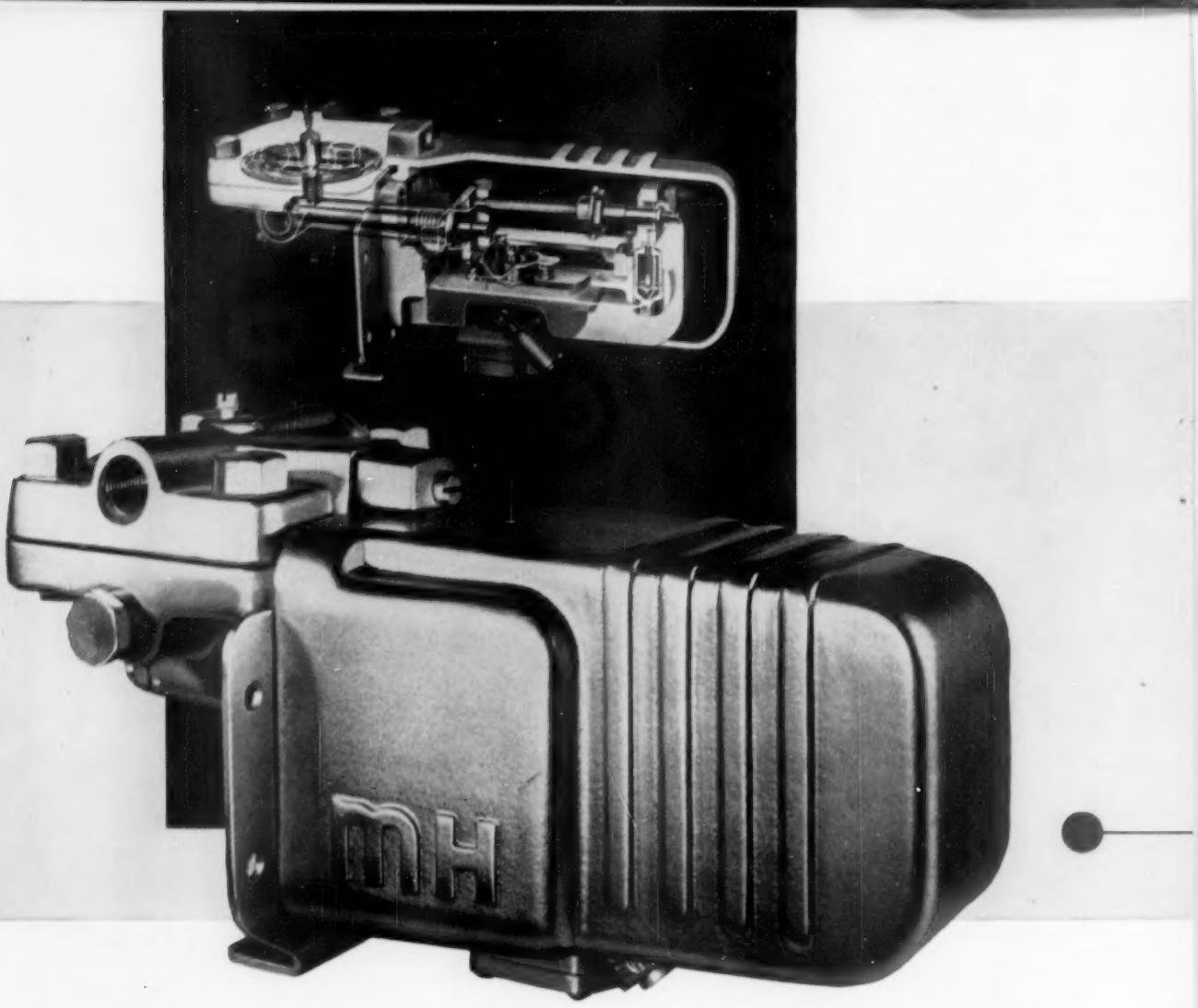
"Blue Flame"

INFERNO

Low Pressure Gas Burner

Mixes the primary air and fuel with a double reversing principle to secure the best possible mixture to afford a hot blue flame, resulting in maximum horsepower at minimum cost. INFERNO Low Pressure Gas Burners are strongly constructed to withstand roughest oil field usage. Write for Bulletin No. 30.

THE INFERNO CO.
Box 1138A
115 RICOU St.
SHREVEPORT, LA.



Every feature your application requires!

CONTINUOUSLY ADJUSTABLE RANGE
Easy field adjustment of range from 0-20 to 0-200 inches of water.

SIMPLE DESIGN
Uses no mercury . . . has few moving parts . . . practically no maintenance.

SIMPLE FIELD CALIBRATION
Check with weights in minutes . . . no curves or tables. 1 lb.=10″ water.

LOW AIR CONSUMPTION
Model with pilot relay uses only 0.05 cfm of air.

HIGH SPEED
Practically instantaneous response to changes in flow or level.

HIGH TEMPERATURES
Withstands fluid temperatures up to 350°F . . . ambient temperatures to 225°F.

RESISTS CORROSION
Teflon diaphragm and stainless steel meter body eliminate usual need for seals or purges.

EASY INSTALLATION
Compact, lightweight unit is easily mounted anywhere.

● ***Plus these new features for liquid level measurements:***

LOWER RANGES
Extended down to 0-14 inches of water for liquid level applications.

VERSATILE CALIBRATION
Direct-reading scale, with up to 100% suppression of calibrated range.

Pace-setting performance for flow measurements— *now for liquid level, too!*

the Honeywell **Differential Converter**

THE remote transmitter that has set new standards of performance in flow applications—the Honeywell Differential Converter—is now available in a new model for liquid level measurements in closed vessels. Suitable for use with either pressure or vacuum vessels, this model offers all the features of fast response, precision, convenience and ruggedness that have earned the Differential Converter wide acceptance throughout industry. The line now covers practically *any* flow or liquid level measurement.

This versatile pneumatic transmitter uses no mercury. It can be used in scores of installations where contamination problems have long impeded measurement. Operating on the force-balance principle, it provides exceptional precision and high-speed response . . . makes possible closer control in the most critical applications.

The ideal companion for Honeywell *Tel-O-Set* miniature indicators, recorders and controllers, the Differential Converter can transmit to any of a variety of Honeywell instruments.

Whenever you have a flow or liquid level measuring problem, you'll find the Differential Converter offers you the top in performance and serviceability. Your nearby Honeywell sales engineer will be glad to discuss your requirements in detail. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Penna.

● **REFERENCE DATA:** Write for Bulletin 2291, "Differential Converter Liquid Level Transmitter", and for Bulletin 1160, "Measuring and Controlling Liquid Level."

MINNEAPOLIS **Honeywell**

BROWN INSTRUMENTS

First in Controls

You're the Boss!

. . . The Choice is Yours!

NO-GALL 50% Zinc Base for those who prefer a zinc base compound.
LO-TORK 50% Lead Base for those who would rather use a lead base compound.

• It's simply a matter of choice. Every unvarying gallon of WECO Compounds minimizes friction, maximizes gall resistance—lubricates without freezing. Both allow for fast, easy make-up and break-out . . . assure you the finest thread protection money can buy. Use NO-GALL or LO-TORK on your next drilling string. They're available at supply stores everywhere.

PESA
PARTNERS IN PETROLEUM PROGRESS

C-2-55

it's wise to standardize with.. WECO

WECO®
WELL EQUIPMENT MFG. CORP. • Division of Chikopi Company • HOUSTON 1, TEXAS

miles southeast of Texarkana. After completion of this hole, it will be moved to 1 Harrell, in 18-16s-27w, 1¼ miles southwest of Genoa, 1⅝ miles north of Boyd.

J. I. Roberts Drilling Co., Shreveport, has a 6,000-ft. test under way in the old Zwolle field, in Sabine Parish, North Louisiana. It is a contract job for B. W. Wooley, of Dallas. The test is carried as 1 Hicks. Location is about 2 miles southwest of Zwolle, in 11-7n-13w.

Foster Drilling Co., Richmond Tex., has a new contract operation under way in the Liverpool area, of Brazoria County, Texas Gulf Coast. It is a 10,800-ft. test for Ada Oil Co. at 1 Todd Unit 2, in the Hall & Bradley League.

Southern Six Drilling Co. has contracted for an 11,000-ft. test to be drilled for SoRelle & SoRelle, of Houston, in Vermilion Parish, coastal Louisiana. Location, at 1 Trahan, in 30-11s-3e, is about 3 miles north of gas production in the Abbeville area.

Dillard & Waltermire Drilling Co., Houston, is drilling for Richardson & Bass at 1 Humble - Continental - State Lease 2513, a new wildcat operation in the Pointe a la Hache area, of Plaquemines Parish, southeastern Louisiana. Hole, directionally drilled, is projected to 12,500 ft.

Superior Drilling Co. is contractor on a projected 8,500-ft. test Caroline Hunt Trust Estate is putting down 1½ miles northwest of Humble, in northern Harris County, Texas Gulf Coast. Location, at 1 Bender heirs, in the J. Pruitt Survey, is about a mile west of production.

Big "6" Drilling Co., Houston, has a rig on a 6,000-ft. wildcat test 5 miles north of Berclair, in Goliad County, South Texas. It is a contract job for George R. Brown. Listing is 1 Pettus, with location in the Caleb H. Jeffrey Survey.

Circle Drilling Co., Lake Charles, La., has contracted with Redlands Oil Co. for another wildcat test the latter company is undertaking in West Baton Rouge Parish, southern Louisiana. New operation is at 1-A Morley Cyprus Co., in 33-6s-11e, about 3 miles southeast of Erwinville, and about 2½ miles northwest of Lobell field, nearest production.

Baker-Taylor Drilling Co., Amarillo, Tex., is drilling for Jay Taylor at 1 Waldroup, a wildcat operation in Las Animas County, southeastern Colorado. Location is in 7-33s-57w, about 6 miles northwest of Alcreek. It is a Dakota test.

COOPER T-420

TORQMATIC SELF-PROPELLED SERVICING and WORKOVER RIGS.

PEERLESS WELL SERVICING GENERAL WELL SERVICING

ODESSA, TEXAS
November 29, 1956

Fred E. Cooper, Inc.
Box 1890
Tulsa, Oklahoma

Attention: Mr. J. W. Allen, President

Dear Sirs:

We have your Cooper Model T-420-42 double drum self-propelled unit in well service work.

We find it a good roading unit and as easy to place on well locations as our truck mounted units. Power, brakes, mast and operation fully meet the requirements of the deepest rod and tubing work in West Texas.

I do not know of any better recommendation than to say, just talk to any production man for whom we have done a job on any crew member. Our unit operator, Clayton Robinson, says he did not know such a good machine was built, and just send any man to me for a recommendation".

Yours very truly,

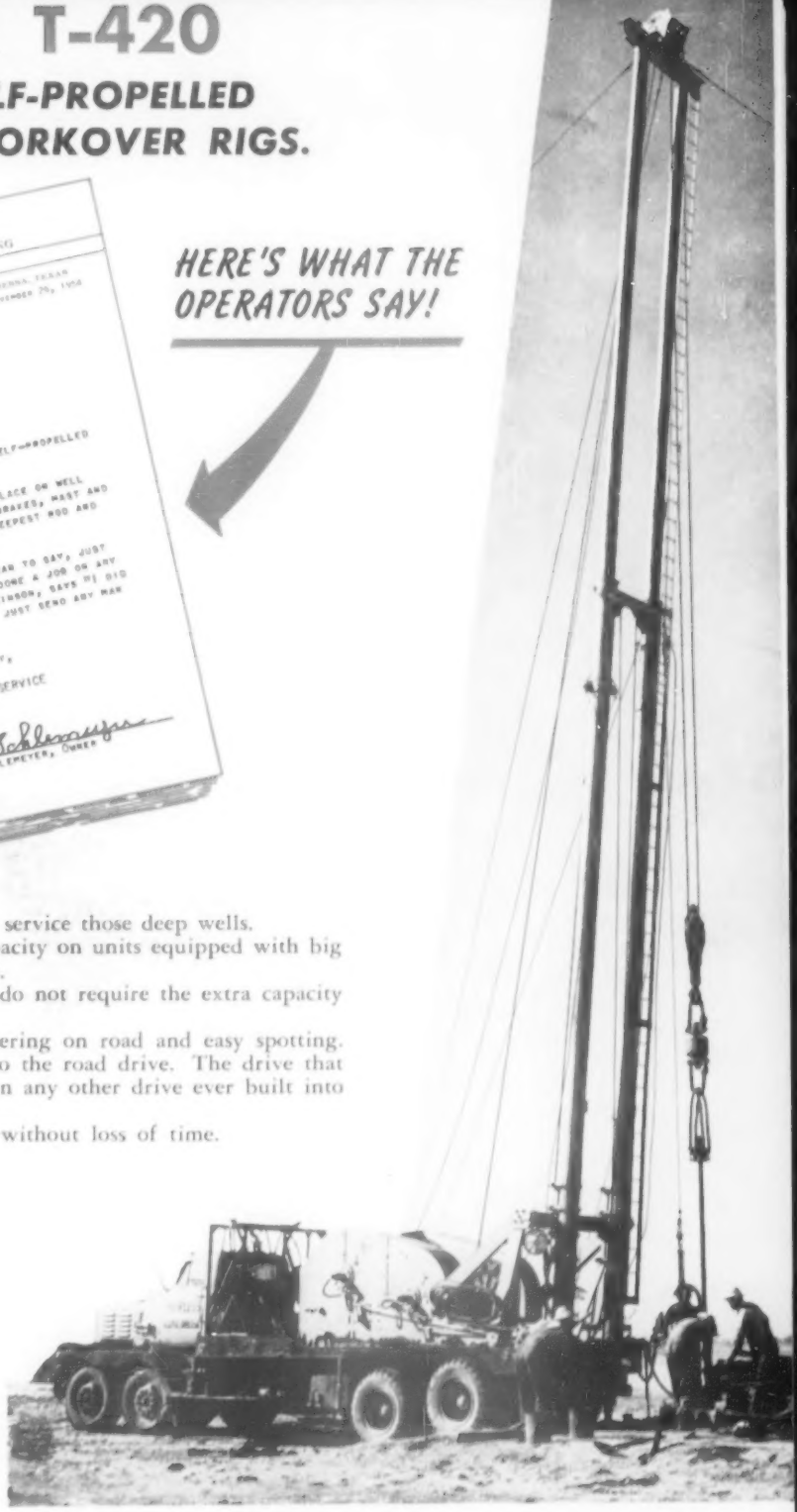
PEERLESS WELL SERVICE

By: R. L. Schlemeyer
R. L. Schlemeyer, Owner

RLS/m

HERE'S WHAT THE OPERATORS SAY!

A really rugged machine built especially to service those deep wells.
Dual front axles for extra load carrying capacity on units equipped with big capacity drums and heavy masts or derricks.
Single front axles are used on units which do not require the extra capacity of dual front axles.
Power steering for practically effortless steering on road and easy spotting.
Torqmatic drive to the winch drums and to the road drive. The drive that is safer and easier to operate and faster than any other drive ever built into a servicing rig.
Shifts gears instantly at full open throttle without loss of time.
Eliminates shocks to sub-surface equipment, winch and road drives.
There is no bucking or stalling engine in sand and mud or when spotting on location.
There is no engine clutch to operate or maintain.
Air friction clutches in the drums are self-adjusting.
Why not let a Cooper sales engineer explain in detail the many features and advantages of Cooper Torqmatic drive rigs.



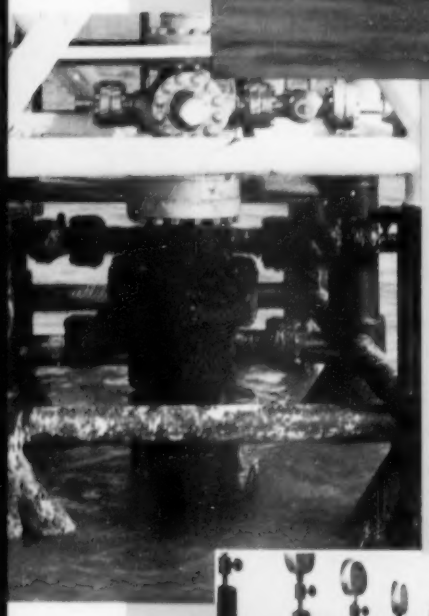
It will pay you to get facts and prices on Cooper equipment before buying.

There is a size and type for any depth or field condition.

FRED E. Cooper, Inc.

P. O. BOX 1890 TULSA, OKLA.

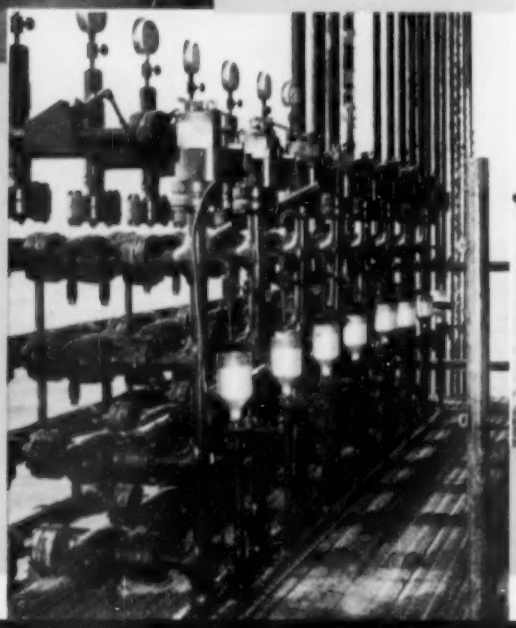
Houston • Odessa • Los Angeles • Olney

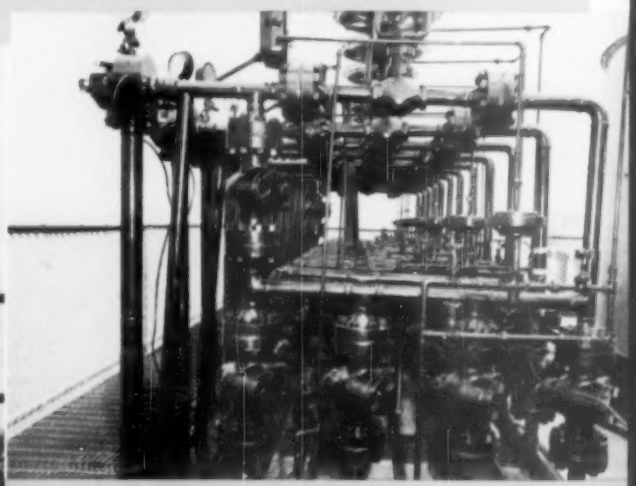


Many of the lessons learned on land are being put into practice at sea by oil operators who are pushing the search miles off-shore. For example, experience has proved that only the very best equipment can meet the working requirements for these remote locations. Operators at sea . . . like operators on land . . . select Mission Plug Valves because they are thoroughly proved under all conditions. In fact, there are almost a hundred Mission Automatic Lubricated Plug Valves in use on this one platform alone.

The Mission Automatic Plug Valve's outstanding features are: (1) a split core that prevents wedging and assures a perfect fit. (2) Two lubricant reservoirs, operated by line pressure, automatically supply lubricant to sealing grooves. (3) Full port lubricant grooves encircle both ports insuring perfect seal and complete lubrication. (4) No lubricant port ever crosses a body port.

Mission Plug Valves, like all other Mission products, carry the famous Mission guarantee and are available through all supply stores.



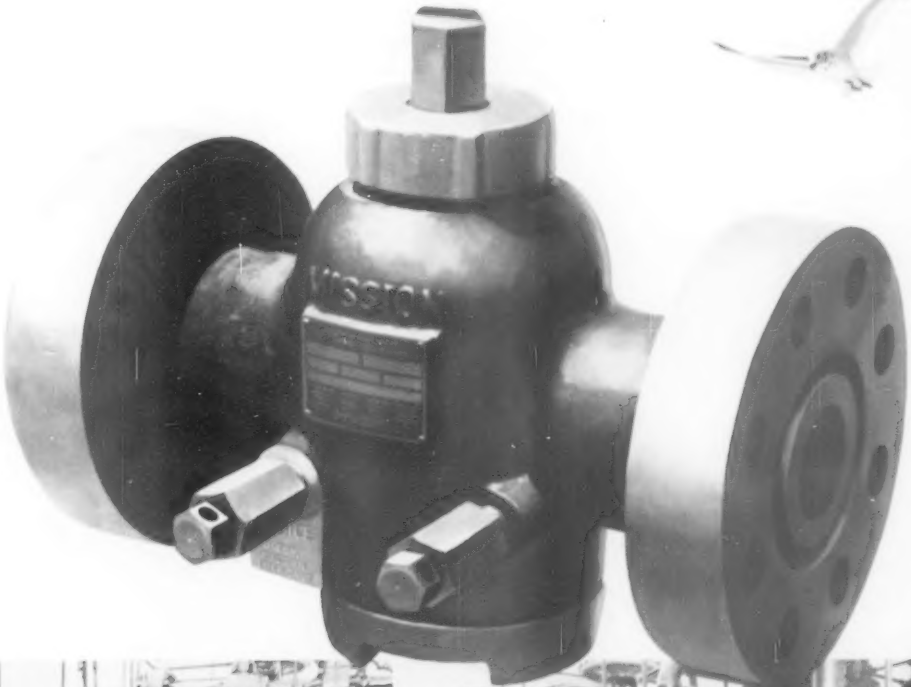


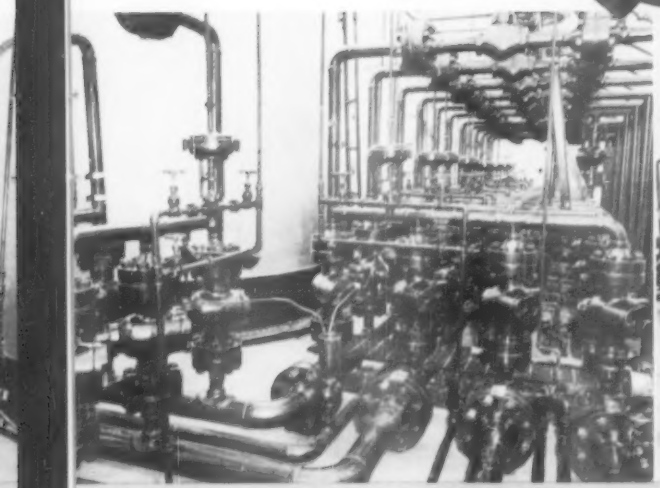
Nothing but the finest

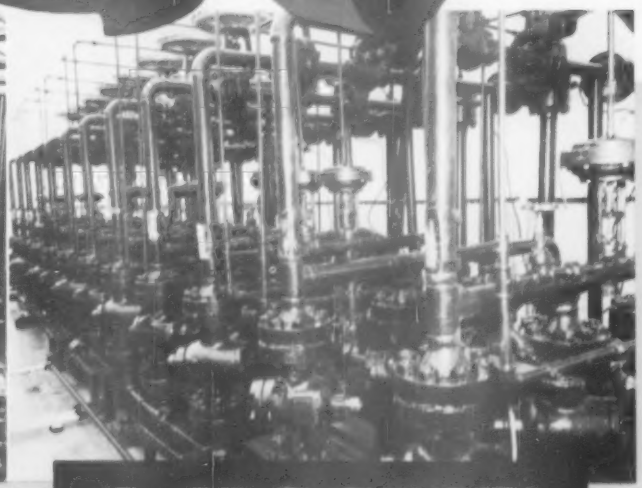
Out here ***they put in the "First Team"***

MISSION

AUTOMATIC LUBRICATED PLUG VALVES





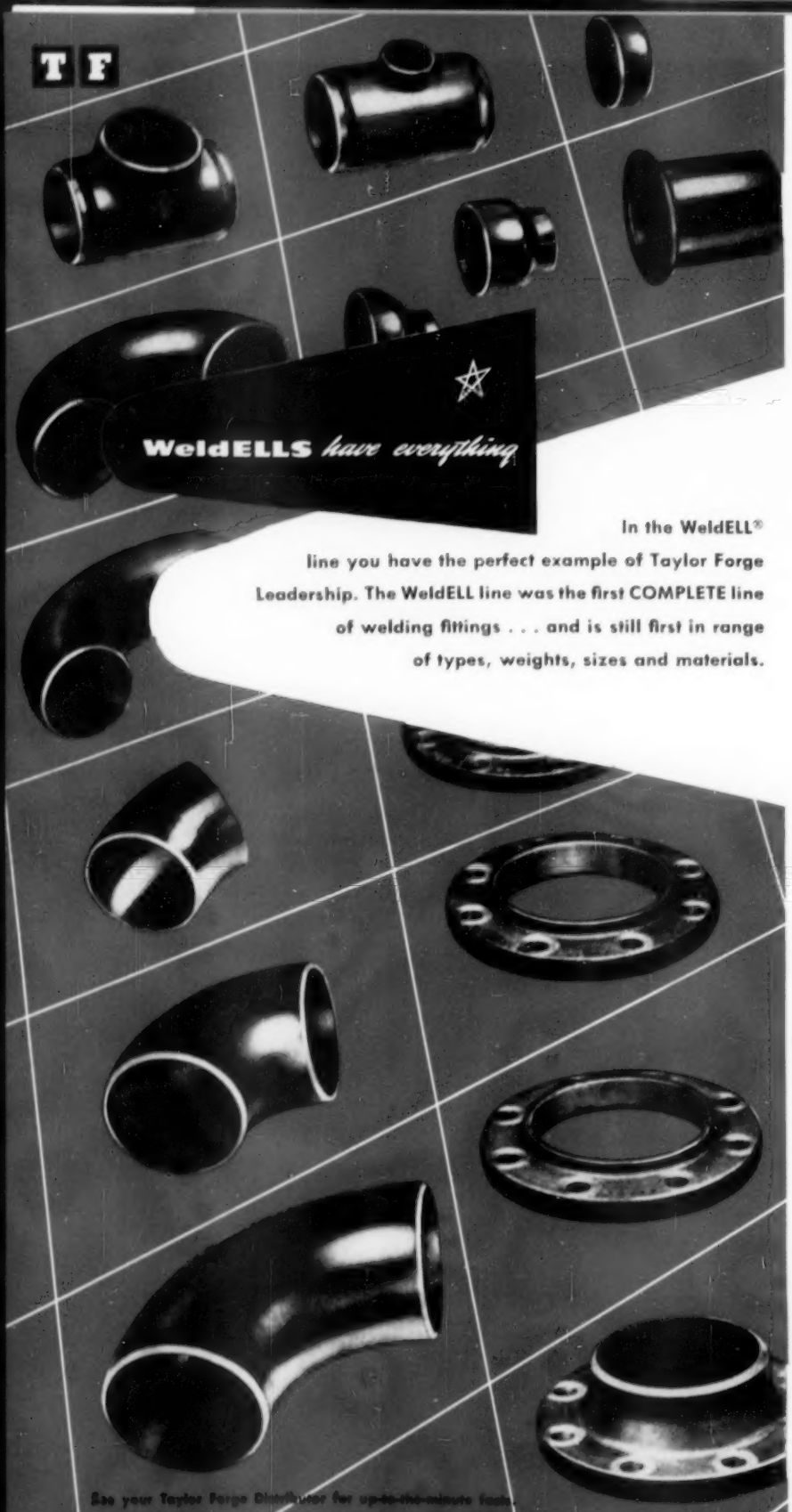


will ever bear the name of

MISSION
MANUFACTURING CO

P. O. BOX 4209 • HOUSTON, TEXAS

Export Office: 30 Rockefeller Plaza, New York



In the WeldELL® line you have the perfect example of Taylor Forge Leadership. The WeldELL line was the first COMPLETE line of welding fittings . . . and is still first in range of types, weights, sizes and materials.

See your Taylor Forge Distributor for up-to-the-minute facts.

TAYLOR FORGE

TAYLOR FORGE & PIPE WORKS • General Offices and Works P.O. Box 485, Chicago 90, Illinois

Offices in all principal cities • Plants at: Carnegie, Pa.; Fontana, Calif.; Gary, Ind.; Pittsburg, Ontario, Canada

GROWTH

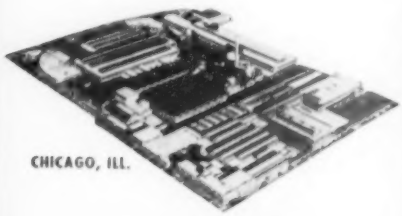
steady—sturdy—ceaseless

From a humble start in a 19′ x 25′ building hardly big enough to be called a plant, Taylor Forge has grown, since 1900, to encompass four substantial plants in the United States and one in Canada. This without merger or purchase of other enterprises: just steady, sturdy and continuous expansion that resulted from improvement of existing products and the development of new products.

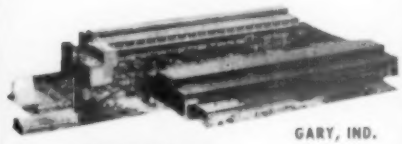
Important contributions in the field of piping—both as a transportation system and as a means for transmitting power — were made possible through constant research and investigation of those problems by Taylor Forge.

So, after all, the real factor in the growth of Taylor Forge has been a continuous growth in the knowledge of piping needs; in developing products to meet those needs; in devising facilities to make those essential products.

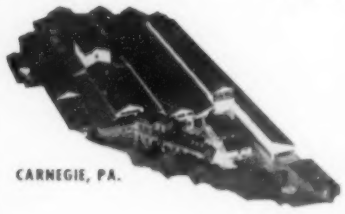
Many of those who, through the years, have relied upon Taylor Forge still insist on Taylor Forge products for all important piping. By the same token, year after year, many others discover that all Taylor Forge products fully justify their complete confidence.



CHICAGO, ILL.



GARY, IND.



CARNEGIE, PA.

FONTANA, CALIF.

P. O. BOX 4209 • HOUSTON, TEXAS
Export Office: 30 Rockefeller Plaza, New York

. . . What's New in Equipment?

Use the handy Time-Saver Cards ✔✔✔ to obtain additional information on these items

by Dan B. Miller

Drive-In Rambler Made for Flexibility

The Drive-In Rambler is designed for faster rigging up, faster moves, and maximum use of all components in servicing, work-over, and light drilling. Rig, mast, draw works, engine and driver's cab have been integrated into a single, self-propelled, 8-ft.-road-width carrier. The same engine, torque converter, and transmission serves both highway and oil field functions. Heading into location rather than backing in makes spotting a fast operation.

A trussed-type vehicle frame combines great strength with minimum weight. All four front wheels have power steering for easy handling and for a short turning circle. With a powerful engine and a three-speed Torqumatic transmission, the Drive-In Rambler has outstanding hill-climbing and maneuvering ability.

Ideco Hydrair hoists are available in the 100 to 350-hp.-input range. Rig air controls are centralized in a remote panel attached to the mast leg. On the highway, the driver controls the mobile power with a single hand lever and foot throttle.

Two types of masts are now in use with the Drive-In—the Kwik-Lift and the Kwik-Lever-Lift. Heights range from 65 to 103 ft. The Kwik-Lever-Lift is raised to vertical by mechanical lever-lifting legs which are later pivoted to the side as outrigger stabilizers, eliminating the need for external guy lines. The Kwik-Lift is a guyed mast, raised to vertical by a three-stage hydraulic ram. Both masts telescope in the vertical position by wire line and are equipped with positive safety locks. When telescoped and lowered to the over-the-road position, both masts are transported without disassembly and with all lines strung. *Ideco, A Division of Dresser Equipment Co.*

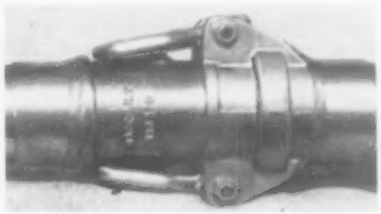
Check No. 1 On The Time-Saver Card

●

Aluminum Coupling Speeds Temporary Line Laying

A lightweight yet sturdy aluminum pipe is now being used extensively in petroleum areas for temporary oil, water, or gas lines.

Heart of the new development is a special coupling devised to withstand high pressures of oil, water, or gas. It is quick to assemble and dismantle, yet it provides a nonleaking joint when coupled.



In actual practice, the new aluminum lines can be installed in the field 10 times faster than steel pipe. Weighing only one-sixth as much as steel pipe, the aluminum lines can be installed with far less manpower. As much as 3 miles of pipe can be handled on one truck with ease. *Race & Race, Inc.*

Check No. 2 On The Time-Saver Card

●

Gage Lighting Is Improved By Redesigned Illuminator

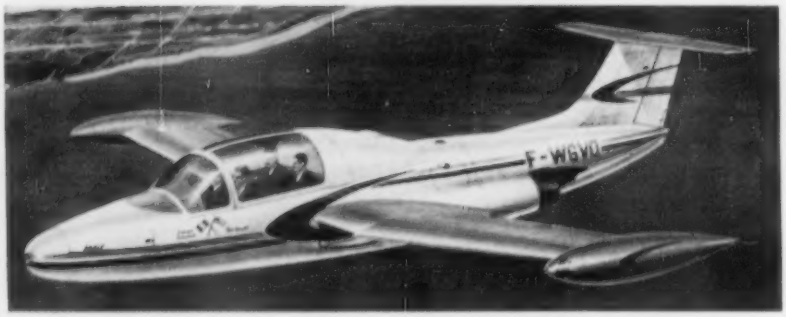
These redesigned and improved gage illuminators bring new efficiency to liquid-level gage lighting. They diffuse light evenly over the entire length of the gage glass, with no glare spots or blinding areas.

The illuminators incorporate the principle of solid-wedge lighting combined with plastic. Illumination comes from a single light source—a 15-watt bayonet-base bulb on the EPL 51 Model, and up to a 60-watt medium-base bulb on the EPL 54 Model. This light is reflected from the angular surface of a ¾-in.-thick plastic wedge and flows with evenly-diffused intensity through the transparent gage glass. The plastic wedge is mounted in an improved way that leaves a space between the wedge and the glass. This makes cleaning easier and leaves an air-cooling space which allows the illuminator to be used on higher-temperature gages.

These illuminators are available in explosionproof or nonexplosionproof models. The light unit for the explosionproof models is approved by Underwriters' Laboratories as standard for electric-lighting fixtures, hazardous locations, Class 1, Group D services. *Ferguson Gage & Valve Co.*

Check No. 3 On The Time-Saver Card

What's New... Use the handy Time-Saver Cards



Beech Introduces Jet Aircraft

This new, four-place, twin-jet, pressurized airplane has a top speed of 405 m.p.h. Designated the M-S 760, it is a low-wing monoplane that will operate out of medium-sized airports.

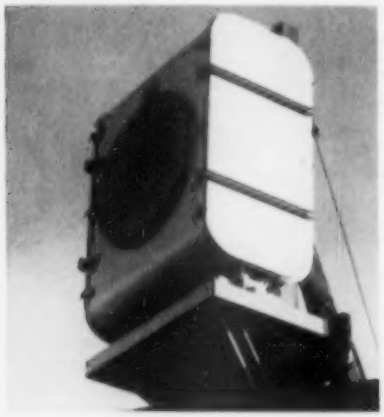
All the occupants sit forward of the leading edge of the wing and are surrounded by a one-piece pressurized bubble canopy. The four passengers are protected against excessive sunlight by adjustable curtains overhead. The airplane has a useful range which will enable it to make nonstop flights between New York and Chicago, St. Louis and Washington, Seattle and San Francisco, and like distances.

The M-S 760 is a fully developed airplane with such features as dive brakes, cabin pressurization, and full air-conditioning, including cabin refrigeration for hot days. Its structural factors of safety far exceed the requirements for modern transport aircraft which cruise at comparably high speeds.

Maintenance is simplified by careful design. Complete change of both jet engines can be made by four mechanics in 50 minutes total elapsed time, comprising 3 1/3 man hours. *Beech Aircraft Corp.*

Check No. 4 On The Time-Saver Card

●



Microwave Equipment Made For Pipeline Industry

This economical two-way microwave communication equipment has been developed for the pipeline industry. In designing the equipment, emphasis was placed on providing mobility and adaptability. This makes the equipment ideal for both permanent and temporary-type installations. Even emergency requirements can be satisfied by mounting the equipment on light cross-country vehicles. Dependable, uninterrupted service is provided at a low installation and operations cost per channel mile.

Called the Raytheon TCR-12A, the equipment meets all FCC requirements. It provides automatic relaying for distances up to 50 miles. Additional relays can be made by the use of repeater stations. And the equipment can be connected to existing telephone, telegraph, teletype, telemetering, and other types of supervisory units.

The equipment is not affected by adverse weather. It is particularly well suited for rugged mountain terrain and where bodies of water or other natural obstacles create major installation and maintenance problems for wireline systems.

Each unit is completely enclosed in a corrosion-resistant, weatherproof case containing its own thermostat-controlled ventilating system. It is designed for outdoor installation and unattended operation in hot or cold, wet or dry climates. *Raytheon Manufacturing Co.*

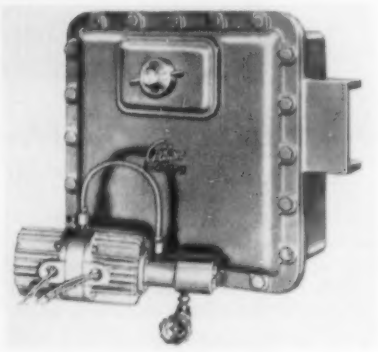
Check No. 5 On The Time-Saver Card

Pipeline Sampler Extracts More Accurate Samples

A new automatic pipeline sampler is designed for extracting more-accurate line samples of crude oil, fuel oil, gasoline, and most other liquids. Because the sampler extracts many minute samples (300 per minute if desired), the composite so gathered is more typical of the constituent flow than are larger samples taken at longer intervals.

This sampler can be supplied with control proportional either to time or to flow. Pressures up to 350 psi. and temperatures to 200° F. can be handled by standard models. Special models are available for higher pressures and 350° F.

The unit has no motor or mechanical switches. It is a small, low-capacity piston pump magnetically operated and controlled by an electronic circuit. The



pump can be set to operate from 20 to 300 cycles per minute, with a delivery range of from ⅓ to 4½ gal. in 24 hours. Stainless steel and other corrosion-resistant materials are used throughout.

The sampler is easily installed and requires a minimum of maintenance. It contains no packing glands, thus eliminating a frequent source of maintenance. The unit is capable of handling liquids over a wide viscosity range and is not affected by changes in liquid viscosity or gravity. *Gilbert & Barker Manufacturing Co.*

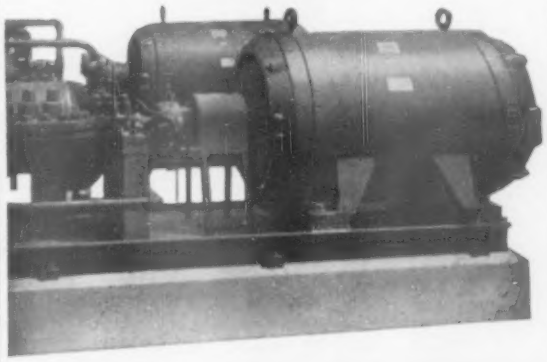
Check No. 6 On The Time-Saver Card

●

Fluid Drive Specifically Designed For Oil-Field Use

A new model of the Gyrol fluid drive is now available in an enclosed, self-contained, packaged unit, manufactured specifically for oil-field application. The new units are designed for compounding multiple-drive engines on large drilling rigs, and can be used effectively with any compound design. They are ruggedly built to meet long-

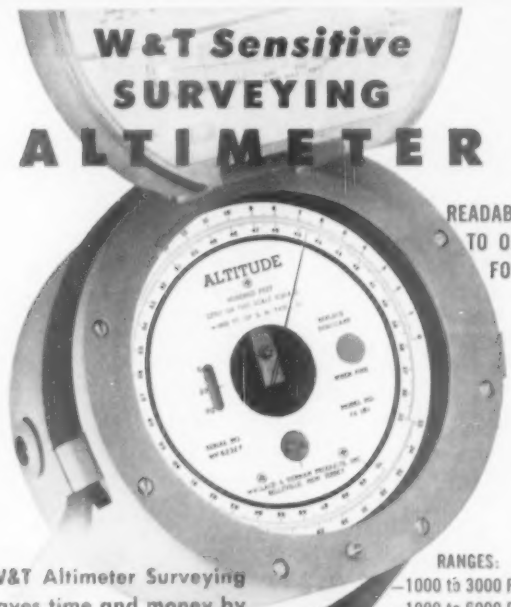
EXPLOSION PROOF MOTORS



Continental
ELECTRIC MOTORS

PLANTS:
17 Main St., Newark 5, N. J.
1240 Harrison Ave., Rockford, Ill.

W&T Sensitive SURVEYING ALTIMETER



READABLE TO ONE FOOT

W&T Altimeter Surveying saves time and money by eliminating lines of sight.

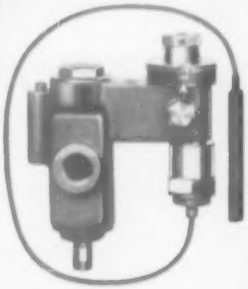
RANGES:
—1000 to 3000 FT.
—1000 to 6000 FT.
—1000 to 15000 FT.

Write today for additional information. A-100

WALLACE & TIERNAN
PRECISION INSTRUMENTS AND ELECTRICAL MECHANISMS
Belleville 9, N. J.
In Canada: Wallace & Tiernan Products Ltd. • Box 54, Toronto 13

temperature control critical?

stop overshooting!



partlow model 70
non-indicating mechanical temperature control

get the facts on this self-contained self-operating control

Use gas or air up to 20 psi? Eliminate sawtooth curves. Get very close sensitivity. Write for Partlow Bulletin 451 covering this mercury actuated control with throttling double ball valve. Other models—1 to 5 psi.

partlow

the pioneer in mercury thermal controls

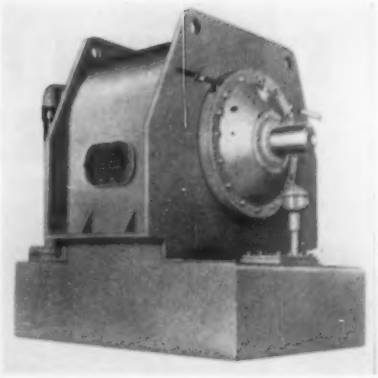
Offices in All Principal Cities
THE PARTLOW CORP., NEW HARTFORD, N. Y.

life service requirements of rotary, slush pump, and draw-works operation.

Designated Type VS Class 2F, the new drives are available in a design which permits infinite adjustment of speed and torque over a wide range. They are built to fit standard, 18-in. channel, oil-field skids. The cushioning ability of this fluid drive is a valuable aid in compounding engines, and it provides flexibility in manipulating pumps.

With the Class 2F fluid drive, it is possible to start smoothly from a standstill against the full-connected hoist load simply by advancing the engine throttle. Rate of acceleration is easily controlled by rate of throttle or scoop-tube advance. This permits selection of draw-works speed for optimum hoisting rate without danger of stalling the engines. Such control produces maximum conservation of engine power.

Increased slip at low engine speeds makes it possible to extend the range of output speeds to a very low r.p.m. This

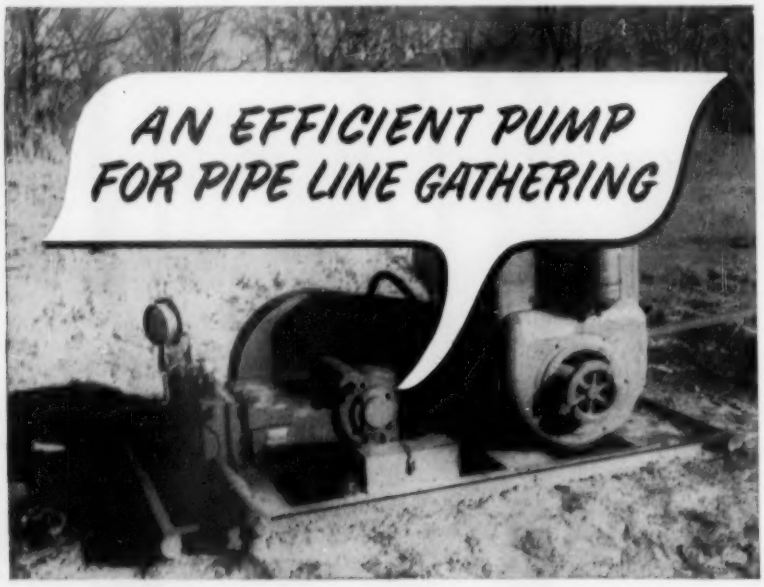


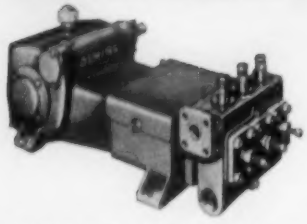
characteristic is of particular value for fishing operations, driving slush pumps at reduced speeds in deep-hole conditions, and coring in soft formations.

For conditions such as testing casings and clearing a plugged bit, the new Gyrol fluid drive permits pressure to be held on the slush pump with the output shaft stalled without harmful results. Since these units are one-to-one torque transmitters, no more than full engine torque is transmitted, thus protecting the pump and the entire power train from overload. Under all conditions, maximum power is smoothly exerted without danger of stalling. *American Blower Corporation.*

Check No. 7 On The Time-Saver Card

●





Triplex Pump

Deming Fig. 2993 "OIL-RITE" Triplex Pump shown at left is the unit pictured in the installation view above.

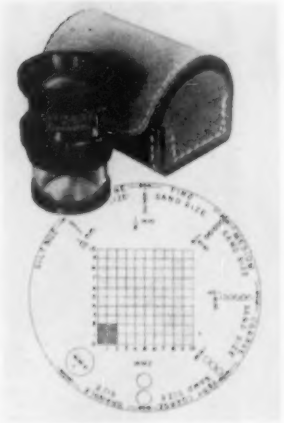
Pipe line gathering is a high pressure job this Deming "OIL-RITE" Pump takes in its stride. You can't top it for trouble-free service. All working parts are fully enclosed, yet easily and quickly accessible. Operation is uniformly steady—practically free from pulsation. Write for details, mentioning Fig. 2993.

THE DEMING COMPANY
559 Broadway • Salem, Ohio

75th ANNIVERSARY DEMING PUMPS 1880 - 1955

See! **DEMING**

FOR THE OIL AND GAS INDUSTRY



Sand-Measuring Magnifier Simplifies Soil Analysis

A new instrument designed to help in sand and soil analysis—or wherever particles of matter are to be measured, counted or compared—makes it possible to anlyze specimens on the spot from which they are taken.

The instrument employes a real etched-glass reticle which is superimposed directly on the specimen. Both

45

45 NELSON CONTROL BOARDS PROVIDE *AUTOMATIC,* EXPLOSION-PROOF CONTROL FOR NEW PIPE LINE . . .

45 Nelson control boards have been installed for automatically controlling compressor engine operations in the compressor stations which are located along a new gas pipe line system. The pipe line extends for a distance of 1,160 miles.

Photo, at left, shows front view of one of the Nelson control boards. Note the following features: explosion-proof indicating lights; pressure gauges; valve motor control buttons inserted in the mimic piping diagram.

Let us quote on your requirements for custom-engineered control boards. Write for descriptive bulletin #712.

NELSON *Electric* MANUFACTURING CO.
TULSA, OKLAHOMA
217 N. DETROIT AVE. TELEPHONE 2-5131

In almost all areas, emulsion muds (oil-in-water systems) increase drilling rates, make better hole conditions, drill into pay formations better, afford better coring, and protect the pay zone from water more effectively. Such factors are easily projected into substantial cost and time savings.

Seeco-Mul, added to the system in quantities of 2 to 3 lbs./Bbl., effectively disperses the oil in emulsion muds which affords better lubricating qualities and allows faster drilling, reduces frictional drag on the drill stem, and provides a higher velocity of the fluid on bottom. Seeco-Mul also forms a thin but exceptionally tough wall cake and is an excellent material for reducing interfacial tensions. It is exceptionally stable at high temperatures and high pressures, it is readily soluble in cold water, and no special equipment or instructions are needed.

Your mud dealer will be glad to tell you about many more features — or write to us; we'll send you full particulars without obligation. Crossett Chemical Company • Crossett, Ark.

Seeco-Mul makes a good mud better . . . and cost less

specimen and reticle are magnified six times by a corrected triplet magnifying lens.

The reticle pattern is designed to show the upper and lower limits of various grain sizes. These limits are as prescribed by generally adopted industry standards. Each upper and lower limit is also given in millimeters.

A grid scale in the center of the pattern facilitates counting particles per square millimeter or per square 0.2 mm. A clear-plastic base admits light to the specimen and the reticle. The reticle, made of optical glass, resists damage by scratching. A focusing ring permits adjustment of the magnifier to the vision of the user. A lock ring keeps it in focus, ready for instant use. And a battery-powered illuminator is available for examining specimens under poor natural-light conditions. *Edmund Scientific Corp.*

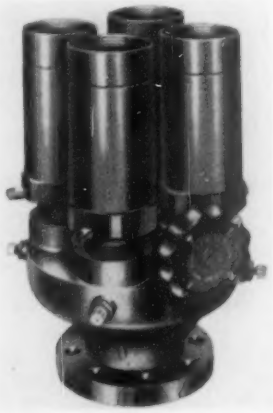
Check No. 8 On The Time-Saver Card

KELITE patented products with exclusive features bring new efficiency to business and industry. That's why the green and yellow KELITE drum is now a familiar sight all over America. For free illustrated Bulletin 136 which describes the remarkable KELITE High Volume Steam Cleaner... or a KELITE Service Engineer to consult on any cleaning problem, large or small... phone your local KELITE office or write KELITE, 1250 N. Main Street, Los Angeles 12, California.

Division Offices in
Los Angeles, Berkeley Heights, N.J., Chicago, Dallas, Mexico City, Toronto
Service Offices in 98 Principal American Cities and 16 Countries Abroad

Relief-Valve Manifold Has Four Complete Valves

This L.P.G. relief-valve manifold provides full protection through a single opening for 30,000 gal. tanks. The new RegO series 7564 manifold is said to be the only one listed by Underwriters' Laboratories.



Four complete valves are provided in the Series 7564 manifold. Any three of these offer a combined capacity of 27,750 cu. ft. of air per minute, or more than ample for a 30,000-gal. container. Because of a patented shut-off system, one relief valve can be removed for test or replacement at any time without affecting the operational performance of the storage tank or the other three relief valves. Construction of the big manifold is rugged and heavy-duty throughout. The body is cast steel and the relief valves are steel with brass liners. *The Bastian-Blessing Co.*

Check No. 9 On The Time-Saver Card

Petrogel Overcomes Ineffective Detonation

An improved formula "Petrogel" gelatin dynamite has been specifically developed to overcome the problem of ineffective detonation. Extensive laboratory and field tests indicate that detonation of the new Petrogel can be initiated and propagated after several days of immersion in deep water. The explosive has a high density and sinks readily in wet holes. Because of its increased density, it is packed in more compact cartridges than any other seismograph gelatins.

A straight gelatin, the new formula Pe rogel is produced in 60 per cent strength. It is available in 2, 2¼, and 3-in.-diameter cartridges which employ the Twistite coupling device for easy assembly into rigid columns. *Atlas Powder Co.*

Check No. 10 On The Time-Saver Card

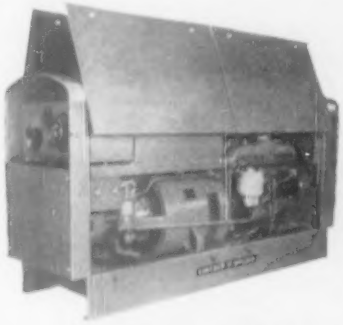
How contractors hold costs on tough stretches

More footage per day is key to lowering costs

40% faster stringer bead and hot-pass welding is reported by pipe line contractors using Lincoln "Shield-Arc SAE" engine-driven welders. Little wonder that "Shield Arcs" are preferred by contractors for 9 out of 10 jobs.

Welds are dependable. Strong pressure-tight welds are easier to make. Operators can select the right type arc as well as the right arc intensity for each job.

Rugged performers. Contractors know they can count on top welder efficiency, day after day . . . with minimum maintenance.



LINCOLN SHIELD-ARC
ENGINE DRIVEN WELDERS
200-300-400 amp sizes

Send for Bulletin 1337. Write.

THE LINCOLN ELECTRIC COMPANY

Dept. 5103 Cleveland 17, Ohio

The World's Largest Manufacturer of Arc Welding Equipment

Designers

- PIPING
- STRUCTURAL

To design new oil-refineries and chemical plants. Please send your resume to our Personnel Department. Your letter will receive immediate and confidential attention.

C F BRAUN & CO
Engineers
Constructors
ALHAMBRA, CALIFORNIA

Telephones:
HOUSTON
UN-1253
MA-5557 MI-9-0747 OX-2-5135
MO-5-6809 TW-1397 OL-1589

TRADE MARK REG. U. S. PAT. OFF.
TIME TESTED
MACCO
GAS LIFT

ALICE
4-4993 4-5787
MIDLAND
3-3936 2-5323
VICTORIA
Hillcrest 5-1731 WJ-53395
BEAUMONT
5-1958 ZF-78424
LAFAYETTE, LA.
8-9851
HOUMA, LA.
2-2147 7728
NEW IBERIA, LA.
2-8165 2-9878
HOBBS, N. M.
3-5059
*LOS ANGELES, CALIF.
JE-5261
*VENTURA, CALIF.
MI 3-4033
*TAFT, CALIF.
5-3244
* Calif. Rep. Emsco Mfg. Co.

They're NEW

- Bulletins
- Catalogs
- Brochures

for your copy, check ✓ ✓ the Time-Saver Cards.

Direct-Flow Pumps. A new bulletin, Data Sheet 63, covers the design, operation and advantages of the Powr-Pac 2½-in. stroke, direct-flow pumps. This four-page, two-color bulletin uses photographs and line drawings to illustrate pump construction and operation. The Powr-Pac, smallest of the line of direct-flow pumps, is designed for installations which heretofore were forced to use larger pumps than were actually needed. Tables list specifications including ranges of plunger sizes (from 11/32 to 2½-in. diameters), pressures (from 390 to 20,700 psi.) and displacements (from 2.08 to 109.6 g.p.m.). *Aldrich Pump Co.*

Check No. 11 On The Time-Saver Card

●

Santolene C, a single-treatment rust and corrosion inhibitor for petroleum products, is the subject of this new booklet. An ashless organic liquid, the material prevents rust and corrosion problems in clean petroleum products at concentrations of from 10 to 40 p.p.m., depending on the corrosiveness of the product. It is compatible with the antioxidants, scavengers, dyes, and other additives used in gasolines. Case-history figures are presented to show how its use in tankers, pipelines, storage tanks, and other petroleum handling facilities has resulted in considerable reductions of equipment and maintenance costs. *Monsanto Chemical Co.*

Check No. 12 On The Time-Saver Card

●

Portable HILCO Hyflow Oil Filters. The four-page bulletin discusses oil-maintenance ability of Hyflow oil filters and lists their uses. Bulletin 316 includes illustrations of some models and provides reference for specific data. *The Hilliard Corp.*

Check No. 13 On The Time-Saver Card

●

Nordberg Power Chief Diesel and Gas Engines. Printed in two colors, 12-page bulletin No. 239 shows product and installation views along with specifications and pertinent data about both

FORCE FEED LUBRICATORS

For operation against discharge pressures of up to 30,000 P.S.I.G.

CHEMICAL FEEDERS

Capacities from .6 pint to 17.5 gallons per hour.

. . . ENGINEERED TO YOUR INDIVIDUAL NEEDS

Manzel

DIVISION OF FRONTIER INDUSTRIES, INC.
336 Babcock St., Buffalo 10, New York

PROTECTION FOR WELLS IN ACIDIZING

AT HIGH AND LOW TEMPERATURES

RODINE® 203

"Rodine" 203 is an organic inhibitor designed especially for the acidizing of well tubing and acid storage equipment.

Economical, effective, and easy to use, "Rodine" 203 provides maximum protection at minimum cost.

ACP *Write for Descriptive Folder* ACP

AMERICAN CHEMICAL PAINT CO.
AMBLER, PA.
Detroit, Mich. Niles, Calif. Windsor, Ont.

series of engines. Both types are compact, complete, and self-contained units. The diesel engines are furnished as one, two, and three-cylinder models ranging from 10 to 45 hp. They are available with stub shaft or clutch power takeoff and as engine-generator sets. The gas engines, built as power units and generator sets in one and two-cylinder models, are rated 18 and 36 hp. maximum, respectively. *Nordberg Manufacturing Co.*

Check No. 14 On The Time-Saver Card

●

Autronic Control System. This new condensed catalog, A1.3-1, printed in two colors and punched for insertion in standard three-ring binders, illustrates and gives a brief description of the function and working principles of each unit in the Autronic Control system. *The Swartwout Co.*

Check No. 15 On The Time-Saver Card

●

Kelloggram. How to realize maximum economy in land, construction, and material costs of a petroleum refinery, and how to reduce the complex elements of a refinery to a simplified system, are the twin subjects of the current issue of the Kelloggram, published for the petroleum and chemical industries. This issue, describing the "in-line" system of plant design, highlights: (1) high initial output in relation to combined costs of land, construction, and labor; (2) flexibility of plant design for future development and expansion; (3) minimum construction costs, reduced maintenance costs later; and (4) clean-lined plant design for community acceptance. *The M. W. Kellogg Co.*

Check No. 16 On The Time-Saver Card

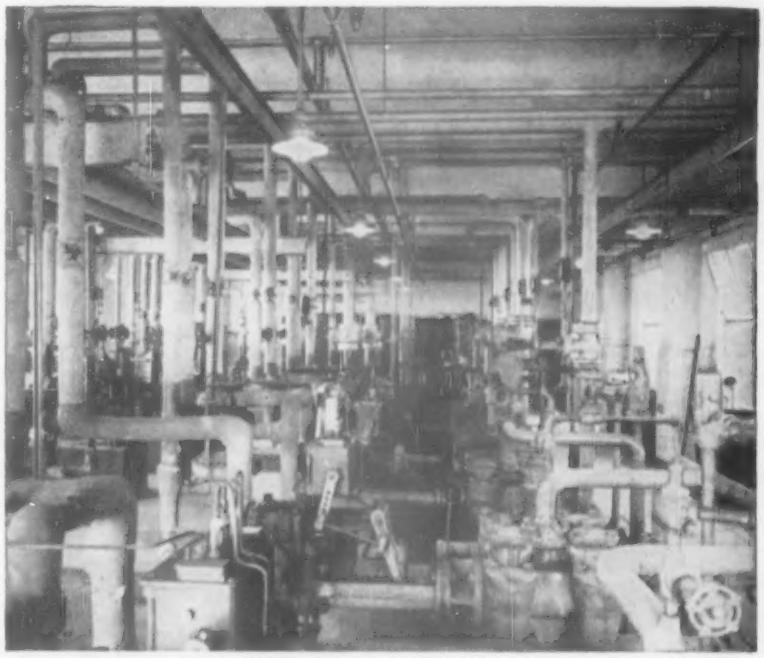
●

Secondary Recovery for Water-Flooding Systems is the title of new seven-page bulletin W-414-B21 which offers information on water supply, injection, and disposal pumps. Photographs are used to illustrate testing and warehouse facilities, and oil and water field installations. Photographs along with information explain the application of different pumps used for water supply in lakes, rivers, and ponds. Information is presented on the complete Worthington line of injection pumps. These pumps are classified in three groups: low-pressure centrifugal; medium-pressure piston; and vertical high-pressure plunger pumps. *Worthington Corp.*

Check No. 17 On The Time-Saver Card

●

Ball-Bearing Swivel Fittings. This engineering handbook describes eight



ENGINEERED PROTECTION

To Lick Fire—Maintain Profits!

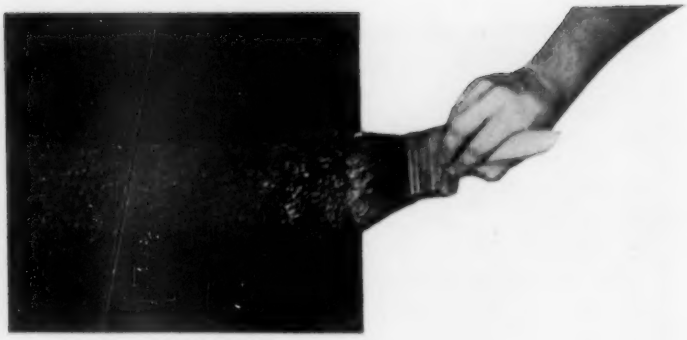
Close inspection reveals much more than meets the eye in this petroleum refinery pump room. "Automatic" FIRE-FOG protection, ENGINEERED to this specific risk, is ready at all times to detect and extinguish fire, should it threaten to destroy property, halt production, reduce profits.

This is but one type of a wide variety of fire-fighting systems designed, manufactured and installed by "Automatic" Sprinkler Corp. of America. Others employing AIR FOAM, high or low pressure CO_2, Dry Powder, etc. stand guard over scores of petroleum and petro-chemical properties throughout the world.

The time to plan ENGINEERED "Automatic" FIRE PROTECTION is **before** fire strikes—not **after** fire has destroyed. Contact your nearest "Automatic" Sprinkler fire protection engineer for an appointment with a Safety First future. He'll gladly prepare a fire protection analysis for you without cost or obligation.

"Automatic" Sprinkler
CORPORATION OF AMERICA
YOUNGSTOWN, OHIO

Offices in Principal Cities of North and South America



STRIP PAINT

WITH A BRUSH

in seconds

Take a stop watch in one hand and a brush full of Oakite Composition No. 57 in the other and see for yourself how this amazing new paint stripper goes to work in seconds . . . practically lifting the paint behind the brush.

See how Oakite Composition No. 57, paint stripper extraordinary, clings to vertical and inverted surfaces, eliminating costly waste. How easily loosened paint rinses away with water pressure spray.

Oakite Composition No. 57 is tops for removing those tough alkaline resistant paints from surfaces that just can't be dip-stripped. Get the full story today by writing for Special Report B-2415 and the Paint Stripping Handbook F-7893. Both FREE. Write Oakite Products, Inc., 44C Rector St., New York 6, N. Y.

SPECIALIZED INDUSTRIAL CLEANING

OAKITE

MATERIALS • METHODS • SERVICE

Technical Service Representatives in Principal Cities of U. S. and Canada

basic styles and over 500 models of Emsco ball-bearing swivel fittings. These fittings are designed with large fluid passage-ways and smooth contour of bends to reduce turbulence and increase flow. *Emsco Manufacturing Co.*

Check No. 18 On The Time-Saver Card

●

Flow Switch, a new four-page bulletin 211-1, presents specifications, operating characteristics, and outline dimensions of a differential pressure switch for flow, liquid level, and/or differential pressure. *Barton Instrument Corp.*

Check No. 19 On The Time-Saver Card

●

Drumobile. This data sheet illustrates equipment that easily lifts and carries drums or barrels up to 850 lb. in an upright position. Annotated drawings point out specific features such as the safety-locking grip, lifting toe, and bronze-bearing wheels. *Genesee Distributors.*

Check No. 20 On The Time-Saver Card

●

Milwaukee Magnetic Fishing Tool, a four-page bulletin, announces Ideco as exclusive world-wide export distributors. Actual photographs show the fishing tool picking up a 9-in. jet bit weighing 95 lb. Outstanding features stressed include the magnetic basket to catch and hold small junk; circulation returned through the center of the tool where magnetic intensity is greatest; and the high cobalt content which makes the tool powerful. *Ideco, One of the Dresser Industries.*

Check No. 21 On The Time-Saver Card

●

Industrial, Municipal, and Industrial Waste Treatment Equipment. A concise discussion of the basic types of equipment available for treatment is included in brochure No. WC-117, along with photographs of typical installations. The advantages of industrial-waste treatment are present, as well as the types of municipal equipment available. *Graver Water Conditioning Co.*

Check No. 22 On The Time-Saver Card

●

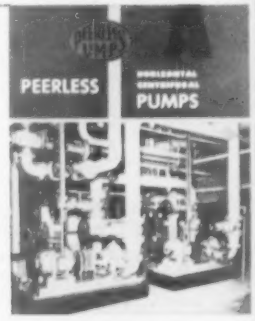
97-Ft. Two-Trailer-Mounted Mast, a four-page, three-color bulletin, presents a new 97-ft. mast designed for rugged-drilling assignments. A series of line drawings show how the trailer mast is connected to the draw works trailer, extended to full length, and raised to drilling position. *Lee C. Moore Corp.*

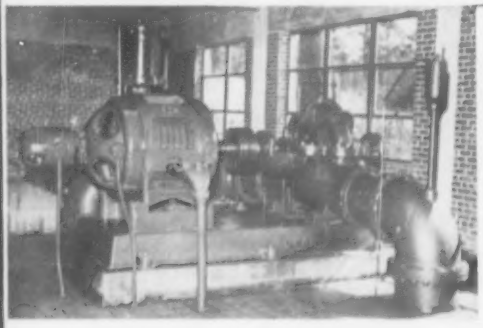
Check No. 23 On The Time-Saver Card

look AT THE PUMPING PROBLEM *two ways*

VERTICAL

HoRizontal





PEERLESS PUMP DESIGNS PROVIDE THE RIGHT TYPE FOR DOING THE JOB BETTER

You pick the design; Peerless will supply the pump. From one of the broadest range of pump capacities, heads, horsepowers, you can choose a Peerless horizontal or a Peerless vertical pump for almost every liquid transfer job, involving either water or process liquids.

In the picture at the top above, a concentrated solution of sulphuric acid and aluminum sulfate is being pumped by Peerless vertical industrial service pumps. To find out all about them request Peerless Bulletin No. B-505.

The Peerless horizontal type A pump shown just above, is one of three that supplies plant water for a textile mill. To find out all about them request Peerless Bulletin B-1300 and B-1350.

Use the coupon below to find how these Peerless designs can meet all your pumping needs with economy, efficiency and dependability.

PEERLESS PUMPS

fmc
FOOD MACHINERY AND CHEMICAL CORPORATION

PEERLESS PUMP DIVISION

FOOD MACHINERY AND CHEMICAL CORPORATION

Factories: Los Angeles 31, Calif., and Indianapolis 8, Ind.

Offices: New York; Atlanta; Chicago; St. Louis; Indianapolis, Ind.; Phoenix; Fresno; Los Angeles; Plainview and Lubbock, Texas; Albuquerque, New Mexico.

Distributors in Principal Cities. Consult your Telephone Directory.

PEERLESS PUMP DIVISION
Food Machinery and Chemical Corporation
301 West Avenue 26, Los Angeles 31, California

Please send bulletins checked below:

- ☐ PEERLESS INDUSTRIAL SERVICE PUMPS (B-505)
- ☐ PEERLESS TYPE A HORIZONTAL PUMPS (B-1300)
- ☐ AND TYPE AS (B-1350)

NAME_____

COMPANY_____

ADDRESS_____

CITY_____ STATE_____

O-21

EQUIPMENT MEN . . . in the News

Petroleum Electric Suppliers Announce New Officers

Newly elected officers of Petroleum Electric Supply Association to serve for 1955 are: A. A. Beltz, Simplex Wire & Cable Co., Houston, director; R. T. Shields, Jr., Anaconda Wire & Cable Co., Dallas, executive secretary and treasurer; R. J. Smith, Nelson Electric Supply Co., Tulsa, vice president; T. C. Savage, Jr., General Electric Supply Co., Houston, president, and A. Frank Ham, Graybar Electric Co. (retired), chairman of the board. Directors not pictured are: Gaston D. Johns, Graybar Electric Co., Houston; John E. Metzenthin, Crouse-Hinds Co., Dallas; W. G. Halsey, Jr., General Cable Corp., Dallas; and Harold L. Kimsey, Motorola Communications & Electronics, Tulsa. Claude R. Miller, general counselor, is not pictured.

Horner Named Assistant Manager of BJ Oil Tool

V. C. HORNER

V. C. Horner has been appointed assistant manager of the Byron Jackson Co. oil-tool division, according to an announcement by Robert Harcus, executive vice president of the company. Horner, a mechanical engineer, has been with Byron Jackson since 1941. He was in charge of oil-tool engineering in the Mid-Continent region and for the past 4 years has been general manager of the BJ Hydralift division which manufactures hydraulic oil-well pumps.

Oilwell Makes Staff Changes in California

William E. Lennard has been appointed city representative for Los Angeles, Calif.; Calvin R. McAffee has been named store manager of the Huntington Beach, Calif., store; and Arthur B. Stonehouse is the new field representative at Castaic Junction, Calif. These job shifts in U.S. Steel's Oil Well Supply Division were announced recently by D. S. Grubbs, manager of Oilwell's California area.

Lennard started with Oilwell in 1948 as assistant district engineer at Los Angeles. In 1950 he was transferred to Long Beach where he served in the same capacity. One year later he was appointed district engineer, machinery and equipment sales and service at Long Beach. In 1953 he was transferred to Los Angeles and appointed assistant to area engineer, the position he held prior to his appointment.

McAffee was employed by Oilwell in 1954 as area order specialist at Los Angeles, the position he held until his present appointment.

Stonehouse joined Oilwell in February of this year as a storeman at the division's Ventura, Calif., store. Prior to that he had 6 years of supply-company experience.

Rockwell Names Assistant Gas-Products Manager

DAVENPORT

Nelson E. Davenport, sales engineer in Rockwell Manufacturing Co.'s meter-and-valve-division district office at Atlanta, Ga., for the past 5 years, has been named assistant gas-products manager with headquarters in Pittsburgh.

According to L. A. Dixon, Jr., vice president in charge of the division, Davenport will report to J. H. Walters, gas-products manager. Davenport worked for Taylor Refining Co. for 3 years before joining Rockwell.

Nordberg promotes Rove and Young to Key Positions

Appointment of Louis C. Rove as district manager of the Great Lakes territory and transfer of William C. Young from that territory to industrial and petroleum sales has been announced by R. W. Bayerlein, vice president, Nordberg Manufacturing Co.

Rove will serve the states of Michigan, Indiana, Ohio, western Pennsylvania, and eastern Kentucky. Young's new assignment is in keeping with Nordberg's expanding program of providing greater service to gas and oil pipelines and to industry.

Rove began his career with Nordberg

LOUIS C. ROVE

W. C. YOUNG

in the engineering department. Shortly afterward he was assigned to the heavy-machinery division and served industry, public utilities, and municipalities in steam engine and compressor sales. He has been active in the diesel-engine field since its infancy.

Young joined Nordberg in 1940 as a cooperative student while attending Marquette University. Following service with the Navy he returned to Nordberg and was appointed sales engineer handling special assignments. He was transferred to the Washington, D. C. office in 1951 where he served in a similar capacity. About 3 years later he was made Great Lakes district manager.

Welex Jet Announces Shifts in Field Staff

Paul E. Ganus has been appointed assistant manager of the Welex Jet Services district office at Wichita Falls, Tex.; Robert J. Rice has been appointed division sales engineer for radioactivity well logging for the Gulf Coast Division; and W. P. (Woody) Weatherby has been appointed sales engineer in the Lafayette, La., district office, the Fort Worth oil-well servicing company recently announced.

Ganus has been with Welex for 2 years. Until his recent promotion, he was sales engineer of the district of-

fice. Rice has spent the last 2 years with various oil and logging companies. Weatherby, who has been with Welex about 2 years, was formerly sales engineer in the Corpus Christi district office.

Maintenance Engineering Adds Bonnette to Staff

M. J. BONNETTE

The addition of Marvin J. Bonnette to the service staff of Maintenance Engineering Corp. has been announced by C. E. Naylor, chairman of the board.

Bonnette will serve as service engineer on Hagan, Sparling, and Cla-Val products. His primary activities will center on service of Hagan controls for combustion and metering equipment.

Technical Oil Tool Completes Meetings

The recent completion of the Technical Oil Tool Corp.'s annual series of service meetings for TOTCO field representatives in the Mid-Continent area has been announced by H. H. (Pete) Peters, president. These meetings were held in Houston, Oklahoma City, and Odessa by Peters, E. G. McConnell, vice president and the division managers concerned, including: R. L. Ray O'Rear, Gulf Coast division manager; Hugh Wethersby, Oklahoma-Kansas division manager; and R. W. (Bo) Ard, West Texas division manager.

Each TOTCO service representative attended one of the meetings. Educational in nature, the program was designed to acquaint the TOTCO field men with new practices and procedures of value to users of TOTCO instruments and equipment. Peters indicated that the meetings stressed practical rather than theoretical matters, in accordance with industry needs.

"With the current trend toward deeper and faster drilling," Peters stated, "users of TOTCO equipment place more and more responsibility on the supplier to furnish dependable, durable equipment and 'round the clock' service. TOTCO's planned educational program helps each TOTCO field man keep pace with the technological advances of the industry."

National Supply Opens Facilities at Corpus Christi

This new store and warehouse building, which also includes the company's district offices, has been opened by National Supply Co. at Corpus Christi, Tex. The building replaces a former store building and separate offices. J. W. Brothers is manager of the store. Victor H. Gardner is district manager of the Corpus Christi district, which also includes stores in Alice, Freer, Hebbronville, McAllen, Pearsall, and Victoria, Tex.

Vinson Supply Elects Two Vice Presidents

The board of directors of the Vinson Supply Co. has elected Louis O. Barnett of Tulsa and B. E. Keeling of Odessa as directors, it has been announced by B. W. Vinson, president. Both Barnett and Keeling are vice presidents.

L. O. BARNETT

B. E. KEELING

Barnett joined the Vinson Supply Co. in 1939. Keeling joined Vinson Supply Co. in 1941. Prior to joining Vinson, Keeling was with Shell Oil Corp. and Westcott & Gries. In 1941, Keeling went to Odessa to direct Vinson activities in that area.

McCullough Makes Kernahan Manager, Canadian Division

KERNAHAN

G. M. Kernahan has been appointed sales manager of the Canadian division of McCullough Tool Co., according to an announcement by Norman Brookes, Canadian division manager. Kernahan will continue to operate out of McCullough's Calgary office, directing and supervising sales operations in

Wilson Supply Opens New Iberia Store

This new Wilson Supply Co. store in New Iberia, La., has 1,000 sq. ft. more floor space than the old location. A complete line of oil-field supplies and equipment, as well as a complete stock of fishing tools, are available at the store. The store personnel shown are: G. H. Carothers, manager fishing tools; L. J. Buford, fishing tool operator; J. C. Glasgow, fishing tool operator; W. G. Akins, district manager; W. E. Barr, field salesman; Earl Rice, office manager; Harry Selcer, warehouseman; J. G. Arceneaux, store manager; Joe Patton, warehouseman; and LeRoy Migues, truck driver.

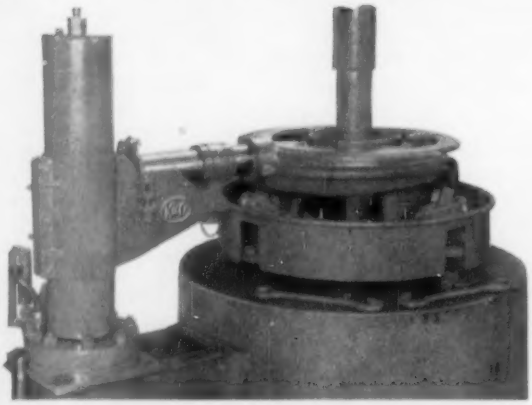
When you see genuine Crosby Clips on the job, you know that safety is foremost. Safety-conscious contractors insist on drop-forged, hot-dip galvanized Crosby Clips. Available in *all* sizes at distributors everywhere.

LOOK FOR THE RED-U-BOLT

CROSBY PRODUCTS DIVISION
AMERICAN HOIST & DERRICK CO. St. Paul 1, Minnesota

KELCO

FOR SAFETY UNSURPASSED
AIR OPERATED POWER SLIPS



Nine years of complete field satisfaction with major companies and drilling contractors.

Available through your favorite supply stores.
Be Safety Wise — KelCo-ize
Representatives in all principal oil fields

KELCO **BEN F. KELLEY CO., Inc.**
TULSA, OKLAHOMA

SPINNING LINE CATHEADS • BREAKOUT CATHEADS • AIR OPERATED POWER SLIPS
TUBING TONGS • SAFETY "C" POLISHED ROD CLAMPS

western Canada. For the past year Kernahan has been district sales engineer at Calgary and prior to this was district sales engineer at the Canadian division headquarters at Edmonton. Before joining McCullough, Kernahan was a logging and sales engineer with Schlumberger Well Surveying Corp.

Pettit to Head Sargent's Merchandising Division

J. H. (Jack) Pettit has been appointed to head Sargent Engineering Corp.'s oil-tool merchandising division, with headquarters in Huntington Park, Calif.

Pettit entered the oil-tool field in 1934 when he was employed by the International Supply Co. in Hutchinson, Kans. From 1936 to 1942 he was with Jones & Laughlin Supply Co., first in Texas and later in Illinois.

His service with Sargent Engineering Corp. began in Illinois in 1942. Later he was assigned to Sargent's general office in Tulsa. In 1954, Pettit was appointed district manager of Sargent's Kansas-Illinois district, and it was from that assignment that he was transferred to his new post.

Black, Sivalls & Bryson Opens Sherman, Tex. Branch

Black, Sivalls & Bryson, Inc., has opened a new branch at Sherman, Tex., to serve increased activity in that area, announces Floyd C. Myers, manager of oil-field sales and service.

Andy Shaw, who has served as branch manager at Oklahoma City for

ANDY SHAW

HUMPHREY, JR.

the past 4 years, has been transferred to Sherman to take charge of the new branch. John B. Humphrey, Jr., salesman at Borger, Tex., has been promoted to branch manager at Oklahoma City, succeeding Shaw.

Shaw has had 9 years' sales and service experience with BS&B at var-

ious Mid-Continent locations. Prior to this Oklahoma City appointment, Humphrey served as sales and serviceman at Seminole and Drumright, Okla., as well as at Borger.

The Sherman branch will be under the supervision of Ralph W. Nichols, oil-field district manager at Fort Worth.

Cooper-Bessemer Elects Devin as Vice President

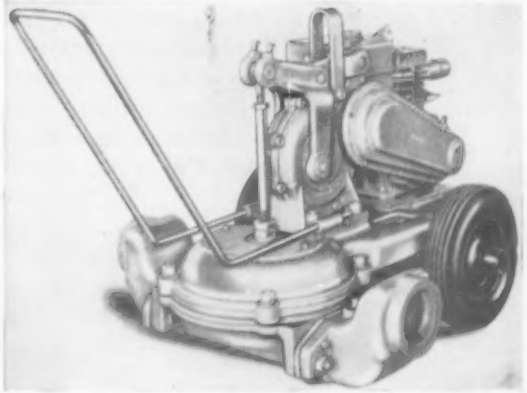
Fletcher Devin has been elected a vice president of Cooper - Bessemer Corp. by the firm's board of directors at their year - end meeting in Mount Vernon, Ohio. The election to vice presidency highlights 35 years of service Devin has had with the company. He started as a sales trainee and worked his way up through engineering and sales. Starting with the original C & G Cooper Co. in 1919, one of his first sales assignments was to open the company's Tulsa office. In 1924 he became branch manager of the company's office at Dallas, a position he held until 1926 when he became district manager at Mount Vernon, Ohio.

Devin is also district sales manager for the territories of Ohio, Kentucky, Michigan, West Virginia, and Tennessee, for engineering and sales of Cooper-Bessemer engine-driven compressors used in gas-pipeline transmission and in refinery service.

S. R. Bowen Co. Opens Store at Odessa

S. R. Bowen Co. has announced the establishment of a new store in Odessa, Tex. O. A. (Jack) Johnson has been appointed manager of the store and will furnish tools on a 24-hour basis to all service companies for use in operations in the Midland-Odessa area.

Two revolutionary new pumps announced by Construction Machinery Company, Waterloo, Iowa



A NEW TYPE VARIABLE-SPEED, VERTICAL-STROKE PLUNGER that assures a much longer diaphragm life and greatly increased efficiency, is a real money-saving feature of CMC'S new SKWEE-GEE diaphragm pump.

A combination 2" and 3" pumper, the SKWEE-GEE is now the best pump in the business for jobs ranging from de-watering to pumping sludge. Can't be beat for high suction lifts, seepage control, small well-point de-watering jobs.

SKWEE-GEE primes dry at 25 feet. Provides total heads up to 40 feet. Standard plunger stroke 3" with alternate 2¾" by simple adjustment. Briggs air-cooled engine.

Write for Bulletin FD-L3-55. **Construction Machinery Company,** Waterloo, Iowa.

TWICE THE PRESSURE of ordinary single impeller pumps is delivered by CMC'S new and different 2-stage dual primer, Model TS-7.

A 1½" pumper with unique type impeller, it's excellent for such jobs as pumping through extended lines and washing equipment. Fine for suction lifts up to 25 feet.

Write for Bulletin TS-7, **Construction Machinery Company,** Waterloo, Iowa.

A Complete Line of Dual Primers from 1" to 10"

Rigid quality controls assure top field performance with UNAFLO*

In every bag of Unaflo Oil-Well Cement you get full measure of uniform, dependable field performance. That's because Unaflo is manufactured under rigid quality controls. Careful testing in the laboratory and during manufacture maintains *consistent* high quality. Trained technicians test samples from shipments to assure proper well-bottom performance.

Oilmen know that this consistent quality means more reliable performance and helps to protect their investments in the field. In emergencies, they're sure of vital extra time because of Unaflo's *retarded* set. And Unaflo slurries pump easily right from the start . . . stay fluid under critical conditions of temperature and pressure. Yet after the retardation period, Unaflo slurries form a strong, tight, sulphate-resistant seal. The name Unaflo is your assurance of high quality and dependable performance. When you're drilling deep and cementing slurries *must* go in place without a hitch, be sure to specify Unaflo Oil-Well Cement.

FOR YOUR CONVENIENCE, we have just compiled a new series of 6 months' average test results for Unaflo's thickening time and compressive strength. All tests are made according to the latest API Recommended Practice for Testing Oil-Well Cements. For your copy of this up-to-date, authoritative data, write Universal Atlas Cement Company (United States Steel Corporation Subsidiary), 100 Park Avenue, New York 17, N. Y.

*"UNAFLO" is the registered trade-mark of the retarded oil-well cement manufactured by Universal Atlas Cement Company

MINNEAPOLIS • WACO • KANSAS CITY • BIRMINGHAM • CHICAGO • NEW YORK
Export Distributor: United States Steel Export Co., New York

Universal Atlas Cement Company

OIL-FIELD CEMENTS

Unaflo *Retarded* Oil-Well Cement
Resistant to Sulfate Waters
Atlas Portland Cement—Type I

Atlas Portland Cement—Type II
Resistant to Sulfate Waters
Atlas High-Early Cement—Type III

OG-U-117

UNITED STATES STEEL HOUR—Televised alternate weeks—See your newspaper for time and station.

EXPLORATION

Hugoton . . . A Stratigraphic Jungle

by John C. McCaslin

THE pre-Permian play in the Hugoton embayment of the western Anadarko basin is now well established. It blossomed early in 1954, spread out later in the year, and now embraces a vast region of the Texas and Oklahoma panhandles and Southwest Kansas. There is utter confusion regarding the structure and stratigraphy of the western Anadarko basin, just as in any young oil province.

With the advent of pre-Permian production an ever-growing list of producing formations is popping up in every corner of the embayment. Thus, the Panhandle geologists find themselves in a stratigraphic dilemma.

Texans find Kansas nomenclature coming up front in their Panhandle fields. Long-used and famous Kansas and Oklahoma formation names move back and forth across the respective state lines. Texans will note on the accompanying correlator that there are only five strictly Texan names in the Panhandle play. Four of these are new producers for the Panhandle, although they are widely acclaimed in other Texas areas. One famous old name, the Ellenburger, recently startled the industry by coming in for flush production in Gray County.

The nomenclature headache is suffered in all new, rapidly growing petroleum provinces.

The Williston and Denver-Julesburg basins, undergoing fast growth in recent years, caused regional geologists to pause in their exploratory race long enough to complete a stable nomenclature. Perhaps the accompanying correlator will serve as a guide for the nomenclature of principal producing horizons in the important areas of the Hugoton embayment, pending adoption of an official composite. Geologists agree the best method is to use series names in lieu of formational nomenclature during this transitional period.

Faulting on the southwestern and western margins of western Anadarko basin is the most difficult problem faced by geologists, in addition to the stratigraphic maze. Exploration calls for detailed stratigraphic study. Most pools are stratigraphic traps and local structure is of secondary importance. All geologists agree that the Hugoton region holds real promise.

HUGOTON EMBAYMENT OF WESTERN ANADARKO BASIN—PAY ZONES—PRINCIPAL AREAS

System and Series—	Southwest Kansas		Northwest Oklahoma		Texas Panhandle	
Permian:	Formation	Field or area	Formation	Field or area	Formation	Field or area
Wolfcamp	Chase Group	Hugoton	Chase	Hugoton	Chase	Hugoton
			Council Grove*	Beaver (indicated)		
Pennsylvanian:						
					Brown dolomite	Quinduno
Virgil (Cisco)	Wabaunsee	Greenwood			Cisco	Dallam,* Sherman*
	Topeka	Greenwood	Topeka	Eva Camrick		
					Granite Wash	Channing, Hartley*
	Shawnee	Greenwood				
	Toronto*	Holt,* Wide Awake*	Toronto*	Mocane area*		
	Douglas	Scattered			Douglas*	Gruver,* Hitchland*
Missouri (Canyon)	Lansing-Kansas City	Greenwood	Lansing*	Texas County	Granite Wash*	Quinduno*
			Kansas City*	Mocane	Tonkawa*	Hansford*
			Checkerboard*	Mocane		
					Canyon	Gruver
					Lovell lime*	Hitchland*
Des Moines	Marmaton	Western Kansas	Marmaton*	Texas, Beaver	Marmaton	Sherman, Cator
	Fort Scott	Western Kansas	Fort Scott*	Keyes*	Strawn	Gruver
			Oswego	Light, Greenough	Oswego	Hansford, Hutchinson
			Cherokee*	Eva*	Cherokee*	Ochiltree, Hansford, Hemphill
					Granite Wash	Hoover, Laketon*
Atokan			Atoka-Lips	Light, Camrick*	Atoka-Lips	Hansford, Ochiltree and Lips
Morrowan	Morrow	Hugoton,* Light, Clark, etc.	Morrow	Liberal-Light, Eva	Morrow	Hansford
	Purdy*	Interstate*	Purdy	Sturgis		
			Keyes	Keyes		
Mississippian:						
Chester	Chester	Kiowa,* and others	Chester	Beaver County	Chester*	Hansford*
Meramec	Spergen	Ford County				
Cambro-Ordovician	Arbuckle*	Scott County	Arbuckle*	Woods County	Ellenburger*	Gray County

*Newly established pools and pays (1954-55).

Fig. 1.

What's Ahead for Geophysics?

by Paul L. Lyons

"The frontiers are still unlimited," says the president of the S.E.G., "for those who arrive prepared with the 'bestest dope and the bestest ideas'." Here's why he thinks so and where he believes geophysicists can most effectively apply their know-how and their equipment in the years ahead.

LAST year, about 325 million dollars were spent on geophysics all over the world. In spite of this, these are trying times for many geophysicists, because of a decline in the use of geophyical parties, especially in the United States.

The regression in world geophysics and exploration is shown by the fact that a world decline from a peak of 1,040 seismograph crews in 1952 to 840 for 1954 has occurred *(see The Oil and Gas Journal, April 4, page 138)*. Significantly, the world reserves of oil, which have followed closely the increasing use of geophysics, have mounted from 116 billion barrels in 1952 to a new high of 158 billion in 1954. As you know, there is always a lag between the finding of prospects and the establishment of reserves, and I venture the opinion that this lag will be reflected in the next few years in the reserve picture for the world. The world reserves will either slow their rate of increase or actually decline slightly.

Domestic slump . . . The most cause for anxiety as to geophysics lies in the United States. If the rise of any industry is plotted on a logarithmic scale, the industry will follow a growth curve called a "logistic curve." The curve is characterized by a preliminary rapid rise, an established rise to a crest, and a slow decline.

The curve for petroleum production in the United States is a logistic curve. The industry has not yet reached its peak production in the United States (see "Cycles, the Science of Prediction" by Dewey and Dakin).

The geophysical industry is no exception to the laws of growth. Both the seismograph and the gravimeter have passed the crest of activity in the United States and seem almost inexorably committed to a long slow decline (Fig. 2). A new cycle may be superimposed on the old declining one to mark the phase of a new advance in the use of geophysics.

Uranium . . . No direct method of finding oil has been found to replace the seismograph or other established geophysical methods. Nevertheless, a very potent nemesis or successor to petroleum itself has appeared — energy from uranium. Already, to some extent, our old oil-finding instruments have given way to the geiger counter and the scintillometer. Like death itself, the ultimate decline of our complex and wonderful oil industry is already distinctly in view. Any discussion of the future of geophysics as we know it must contemplate the ultimate partial replacement of oil and gas as energy sources and the ultimate role of geophysics in finding atomic-energy ores.

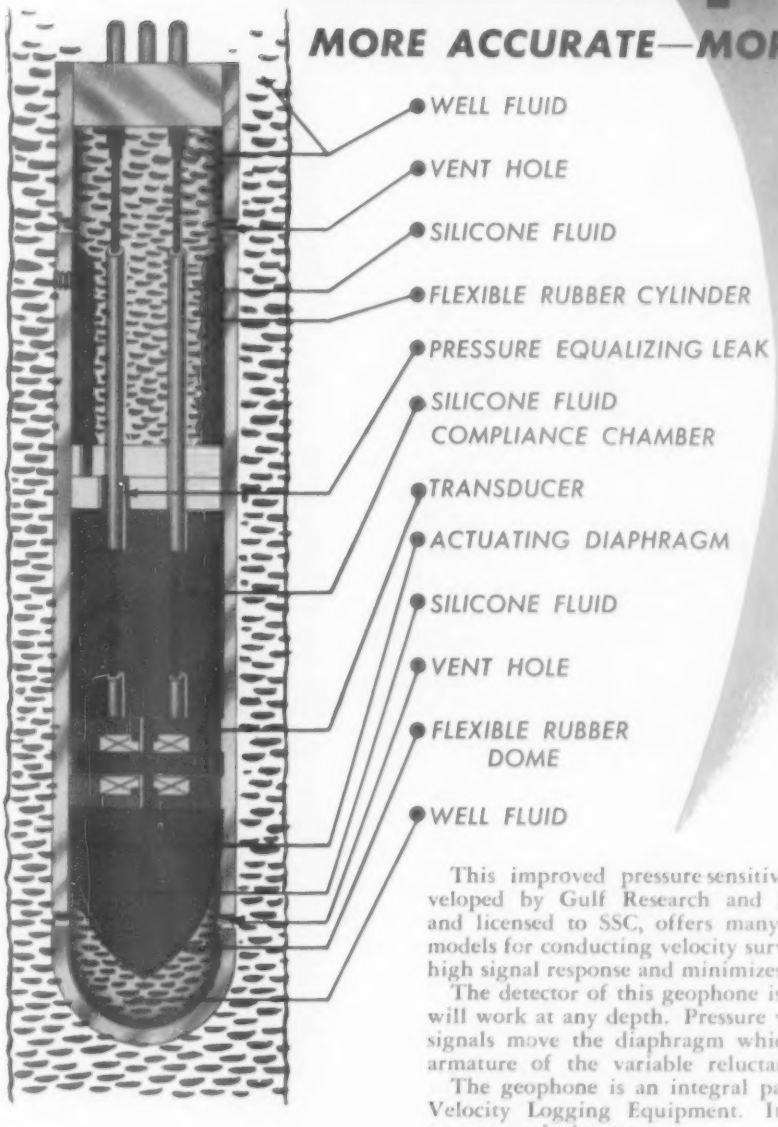
Death of a fable . . . But right now we are worried about a phenomenon not at all brought about by atomic energy—the current decline in exploration in the United States and in the world. This decline is a complex result of economic forces, the vagaries of nature itself, and the working of the minds of men. Perhaps we have even found too much oil. But if one aspect of the exploration picture is to be blamed more than others, it must surely be the demise of the fabled concept of "the firstest with the mostest" (Fig. 1).

*Presidential address delivered to the 1955 joint meeting of the S.E.G., A.A.P.G., and S.E.P.M. by Paul Lyons, president of S.E.G.

†Author is exploration manager, Anchor Petroleum Co., Tulsa, Okla.

An improved **Well Geophone**

MORE ACCURATE—MORE INFORMATIVE



This improved pressure-sensitive Well Geophone, developed by Gulf Research and Development Company and licensed to SSC, offers many advantages over other models for conducting velocity surveys. Its design achieves high signal response and minimizes cable conducted noises.

The detector of this geophone is pressure equalized and will work at any depth. Pressure variations of the seismic signals move the diaphragm which in turn actuates the armature of the variable reluctance-type transducer.

The geophone is an integral part of SSC's Continuous Velocity Logging Equipment. It is your assurance of accurate velocity surveys.

Call, wire or write SSC today for full details on velocity surveying.

SEISMIC SURVEYS — GRAVITY SURVEYS — PILOT CREWS — LORAC — VELOCITY LOGGING

Seismograph Service Corporation

TULSA, OKLAHOMA, U.S.A.

WORLD-WIDE EXPERIENCE

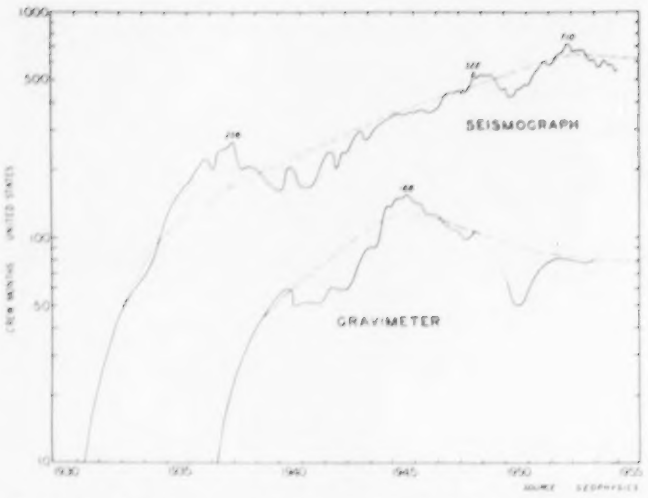


Fig. 2—This chart shows how geophysical activity in the United States has been declining in recent years.

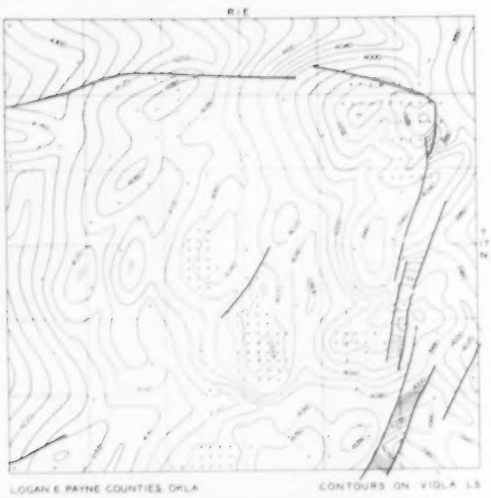


Fig. 3—Microstructures, an important source of oil, can be mapped readily with the seismograph.

In the good old days of this present generation, there were open, inviting frontiers of oil exploration. There were many uncharted areas where the first to arrive with a seismograph crew or a gravity meter could reasonably expect to find bonanzas ready for the plucking.

And so the applications of geophysics which resulted in its rapid rise were the attempts of exploring companies to stay in the vanguard, to push forward rapidly into the geological vacuums, to skim the cream, to find the large fruitful structures that responded easily to geophysical measurement. For example, the 171 major oil fields of the United States, each with over 100 million barrels ultimate reserves, collectively contain over 59 per cent of its total ultimate reserve.

There was a reason for the precipitate rush to be first to find such prizes. And now this feverish rush is over in the United States, for geophysical methods have long since covered most of the country's sedimentary areas. It is no longer possible to be first anywhere. And so the chances for finding large structures or pools are reduced, for the operator must rely on his predecessor's inability to evaluate what has been explored.

Early successes . . . The statistics record the phenomenal results of the first rushes of those who sought to the "firstest with the mostest." For example, 44 salt domes were discovered in Texas in 1930. They were found by three refraction seismograph parties. From 1930 to 1937, 361 seismograph prospects were found in Oklahoma. One hundred eighty-four of these prospects are now known to be structures, and 146 have produced for a success ratio of 40 per cent. Significantly, success ratio in southern Louisiana last year was 45 per cent for seismic anomalies. Southern Louisiana, because of terrain and reflection quality difficulties, has been a lingering frontier, belatedly explored. The same is true to a lesser extent of West Texas, and the success ratio there last year for the seismograph is 25 per cent.

The "firstest with the mostest" technique went on in the tidelands. The tidelands have been and are being explored in a burst of rapid exploration in which marine seismograph parties take literally hundreds of profiles per day, and the large inviting prospects are being or have been gobbled up.

Reworking older areas . . . The results in settled production areas are quite different. In the past 10 years, one in six geophysical wildcats have been proved successful. These figures are partly representative of the effort to find small closed structures overlooked in the first rushes.

The reaction of the oil industry to the increased difficulty, when using conventional interpretation techniques, of finding small seismic closures in picked-over areas has been one of some discouragement. The point of diminishing returns has been reached. The fact is simply this: that, for some operators, geophysical work no longer pays for itself in cold hard cash.

Outlook still bright . . . The geophysical industry will react to this challenge. For it is really a virile, new industry, and there will be another cycle of growth superimposed on the old growth curve. There are a number of reasons why this will be so, and the pattern for the future is evident.

In the first place, there are millions of dollars now invested in the finest assemblage of geophysical equipment ever fashioned. New techniques are available which make it possible to get seismograph results practically anywhere on earth where it is feasible to prospect for oil. Gravity and magnetic methods have long since reached perfection in instrumental accuracy.

In the second place, there are practically unlimited frontiers available even for the late arrivals on the scene. A. I. Levorsen has recently stated that almost unlimited exploration possibilities of this type are still present in the United States.

Microstructures . . . New frontiers exist in what might be called microstructures. Closures of 10 to 20 ft. are significant and worthy of drilling in some areas. In Township 17n-1e of Oklahoma, for example, there are eight proven productive structures for which the closure is 20 ft. or less on the Viola limestone. There are now available interpretational techniques which make accurate work possible, and the seismograph can find small structures even in this difficult area.

Strat traps . . . Some 13 years ago, a study of the oil-producing areas of the Mid-Continent disclosed that at that time only 38 per cent of the ultimate yields of oil from fields then known would be from structural traps. And that the remaining 62 per cent of the oil would be produced from stratigraphic traps, combination structural-stratigraphic traps, and unclassified traps. Since that time, the stratigraphic oil classification has applied to an even higher percentage of the oil found and produced in this area.

It is possible to predict that perhaps 75 per cent of the oil ultimately found in the United States will be

stratigraphic. Hence, in contemplating any new area for possible oil or gas accumulation, we should count on more than half the hydrocarbons discovered being from stratigraphic traps.

In the later production history of an area, the exploratory effort may turn almost entirely to the stratigraphic trap. This is true in central Oklahoma, where the majority of wildcats now being drilled are in search of sand bodies. Oklahoma has a great number of lenticular sand horizons, and they are scattered over a vast area. Yet it is not economically feasible to prospect for them by subsurface methods or random wildcatting alone.

Mapping strat traps . . . Here is a tremendous exploration vacuum — the search for stratigraphic traps — into which the seismograph, with all its instrumental advances and improvements in technique, should step. I believe that it will. We have searched for structural traps because they are easier to pinpoint with the seismograph. But is this necessarily true? Stratigraphic traps are in the majority, and very often they are larger in areal extent than structural traps. It is an amazing fact that the seismograph has played so small a part to date in the location of stratigraphic traps. The problem is to find the existence of a lens of sand in the section and to drill near its updip edge.

A major interpretational step in the delineation of stratigraphic traps by seismograph may be made by mapping every reflecting limestone in the section explored. For we can derive the structural framework and setting for stratigraphic traps from such maps and from other maps derived from them.

Why not map the sandstones themselves? There are mathematical formulae available which permit us to predict the amplitude of a sandstone reflection if we know the velocity of the sandstone and that of the horizon above it. Presence of the sandstone will also influence the amplitude of the reflection from a bed below the sandstone in a predictable manner. These formulae were derived by Muskat and Meres some 15 years ago and published in GEOPHYSICS.

It is possible to identify a sandstone from seismograms and to ascertain its lateral extent in the subsurface by carefully following its reflection until it ceases to be recorded. Thus the seismogram truly has some of the exploration characteristics of the electric log. Changes in reflection amplitude, reflection frequencies, and reflection qualities are all significant. Every seismogram is closely related to sedimentary changes. Yet in the past, records have been almost exclusively used for structural mapping.

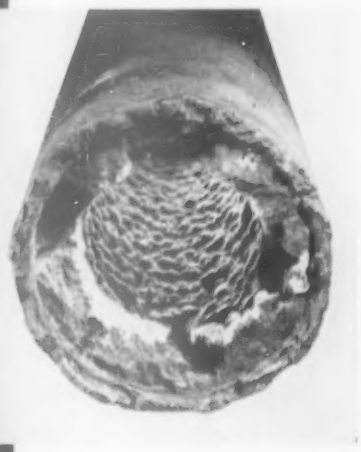
Another factor to be considered is the availability of old seismic records to supplement new data. A significant development in this line is the recent establishment of a seismogram record library where seismograms may be exchanged or rented.

New ideas essential . . . In conclusion, it may be seen that in the future there will be available advanced instruments, new techniques of exploration and interpretation, and new ideas to be applied to geophysics. The most important of these are ideas. The frontiers for those who play "the firstest with the mostest" are limited now. But the frontiers for those who arrive, however late, prepared with the "bestest dope and the bestest ideas" are still unlimited. When these oil finders arrive on the scene in force, new life will be given to our presently lagging exploration efforts.

The United States has produced 50 billion barrels of oil. In addition to its 31 billion barrels reserve, there are perhaps 40 to 50 billion barrels yet to be discovered in this country. There are 400 billion barrels yet to be discovered in the world exclusive of the United States. A changing geophysics has an important place in our changing future.

PARAFFIN your problem?

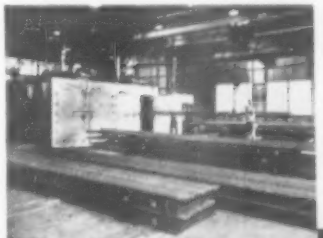
...Then Read This:



A Louisiana oil company had an uncoated string of 2" EUE tubing that plugged in three days. Tubing lined with TK-2 plastic was installed and is working perfectly, even after eight months.

A Texas company experienced heavy paraffin accumulation in flow lines and had to use hot oil circulation as frequently as twice weekly. Tube-Kote lined pipe was substituted and has been in service six years without trouble.

Tube-Kote plastic linings can solve your paraffin *and corrosion* problems, too. WRITE TODAY FOR ILLUSTRATED BROCHURE ON TK-2 PLASTIC LININGS.



▲ Some of the huge bake ovens where TK-2 plastic is bonded to pipe internal surface.

TUBE-KOTE

TUBE-KOTE, INC. - P. O. Box 20037 - Houston 25, Texas

Pioneers in plastics since 1939 . . . manufacturers-extruders of plastic pipe for the oil industry. Factory trained field engineers available for consultation in all principal oil areas.

EXPLORATION HIGHLIGHTS

MID-CONTINENT

OKLAHOMA

Lone Grove Arbuckle Data Released By Frankfort

Information on the deep new-pay discovery in Carter County's Lone Grove area has been released.

Frankfort Oil Co. 2 Williams, SE NW NE 12-5s-2w, recovered 4,938 ft. of 36°-gravity oil on drill-stem test at 12,390-12,435 ft. The bit entered the Arbuckle at 7,718 ft. Reports state that the firm will run production tests. The 2 Williams first found prolific Viola production earlier this year. Other wells in the area went on to complete in that zone, opening good Viola lime production. A trend several miles long looms for the area south of Healdton southeastward to North Marietta area in Love County.

Arbuckle production at this well would establish a new pay of great promise for the region. Closest comparable production is in Grayson County.

Grant County Due to Test Bartlesville Show

Another Bartlesville sand discovery is due for testing in northern Oklahoma's Grant County, west of the Nemaha granite ridge.

A Grant County wildcat reported a show in the Bartlesville sand. It is Calvert Drilling Co.'s 1 Feist, SE SE 11-28n-8w.

Calvert Drilling Co. 1 Feist, SE SE 11-28n-8w, ran a drill-stem test in the Pennsylvanian Bartlesville sand at 4,802-30 ft. Gas flowed in 5 minutes at the rate of 416 M.c.f. Recovery was 298 ft. of gas-cut mud. This new prospect is 5 miles west of a recent Eureka field Bartlesville sand discovery. That Viersen & Cochran strike brought first such production this far west of the granite ridge.

HUGOTON EMBAYMENT

Notes on April Panel In Oklahoma City

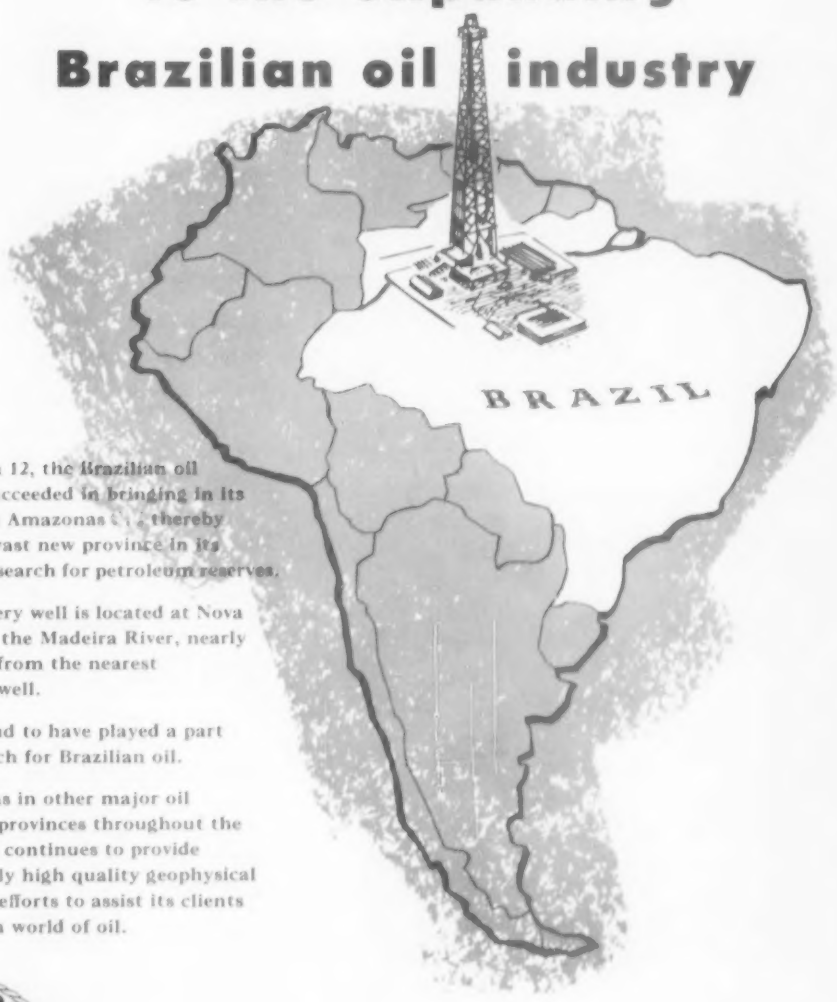
On April 20 in Oklahoma City's Oklahoma Club a panel sponsored by the Oklahoma City, Amarillo, and Liberal geological societies brought to light the growing interest in the western Anadarko basin's potentialities. Speakers at the meeting were: W. H. McConnell, Amarillo consulting geologist, George Dobervich, Amarillo consultant, and Glenn Thomas, district geologist for Lion Oil Co. in Liberal.

Texas portion . . . The Stratford dome forms the western edge of the vast

WHEELING
COUPLINGS
FOR OIL COUNTRY USE
LINE PIPE COUPLINGS A.P.I.
1/8" to 12"—Seamless and Special Processed—Black or Galvanized
PLAIN TUBING COUPLINGS A.P.I.
1" to 4"—Seamless
EXTERNAL UPSET TUBING COUPLINGS A.P.I.
3/4" to 3 1/2"—Seamless
CASING COUPLINGS A.P.I.
4 1/2" to 13 3/8"—Long or Short
HYDRAULIC COUPLINGS
1/8" to 4"—Seamless
REAMED AND DRIFTED A.I.S.I.
3/4" to 12"—Seamless or Special Processed
DRIVE PIPE COUPLINGS
3/8" to 12"—Seamless or Special Processed
Sales Offices in Leading Cities
Albany, N. Y.—Albert L. Becker, 434 Clinton Ave.
Baltimore, Md.—Ted Barto, 2301 No. Charles St.
Chicago, Ill.—Harry A. Jay, Suite 1090, Old Colony Bldg.
Denver, Colo.—Earl H. Jones & Co., 1863 Wazee St.
Erie, Pa.—R. J. Maggi, Box 711
Falmouth, Mass.—Walter S. Bennett, 53 Minot St.
Houston, Tex.—Henry H. Paris Distributor, Inc., Box 932
Los Angeles, Calif.—James A. Riordan Co., 1400 Santa Fe Ave.
Milwaukee, Wis.—M. A. Nelson Co., 3347 N. 97th St.
Minneapolis, Minn.—Lin J. Krause, 5605 Lyndale Ave. S.
Narberth, Pa.—J. W. Worthington, 105 Forrest Ave.
Newark, N. J.—Ira L. Rothenberg & Assocs., Industrial Office Bldg., 1060 Broad St.
New York, N. Y.—Max Rothenberg, 11-05 38th Ave., Long Island City
Portland, Ore.—Earl H. Jones & Co., 1233 NW 12th Ave.
Richmond, Va.—P. C. Abbott & Co., 15 E. Franklin St.
St. Louis, Mo.—Mike A. Boyle Co., 1112-18 Hamilton Ave.
San Francisco, Cal.—Earl H. Jones & Co., 1150 Folsom St.
Seattle, Wash.—Earl H. Jones & Co., 819 Thomas St.
TOP QUALITY Since 1918
WHEELING MACHINE PRODUCTS COMPANY
WHEELING, WEST VIRGINIA
Factories at WHEELING, W. VA. and WOODLAKE, CALIFORNIA

Congratulations

to the expanding Brazilian oil industry



On March 12, the Brazilian oil industry succeeded in bringing in its first well in Amazonas [illegible], thereby opening a vast new province in its expanding search for petroleum reserves.

The discovery well is located at Nova Olinda, on the Madeira River, nearly 1000 miles from the nearest producing well.

GSI is proud to have played a part in the search for Brazilian oil.

In Brazil, as in other major oil producing provinces throughout the world, GSI continues to provide traditionally high quality geophysical services in efforts to assist its clients in finding a world of oil.

1930 1955 GSI 25TH ANNIVERSARY ®

GEOPHYSICAL SERVICE INC.
5900 LEMMON AVENUE · DALLAS 9, TEXAS

Finding a World of Oil for a Quarter-Century

The HERCULES ECONOMICAL

"Type E" Casing Head with Slips

The Hercules "Type E" (for Economy) Casing Head was designed as an economical means of supporting and packing-off casing strings in wells of medium depth and pressure. It is made of electric cast steel and is tested to 3,000 pounds psi. It will safely support in excess of 50 tons of casing with a 2-to-1 safety factor.

The "Type E" Casing Head has the original Hercules overhead packing arrangement. The slips are hinged together, thus making them easy to install. Hold-tight notches are provided in top of packing nut to accommodate trimo wrench or pinch bar to screw it down into the head.

DESIGNED AND RECOMMENDED *By the men who use them*

SOLD AT ALL SUPPLY STORES

"TYPE E" CASING HEAD WITH SLIPS

Write for Complete Information

HERCULES TOOL COMPANY

Manufacturers of Oil Field Equipment

GENERAL OFFICES AND PLANT • TULSA, OKLAHOMA

Export Representative Oil Field Equipment Co., Inc. • 30 Church Street, New York, N. Y.

FREE BROCHURE

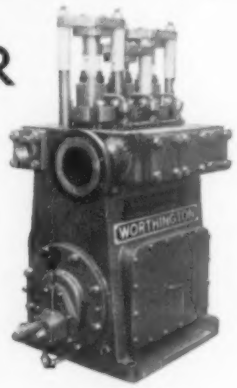
describes new weight-indicator discovery

Bulletin P-10 features the Sensater, a marvelous new kind of Ideal anchoring-type diaphragm pressure transformer for Martin-Decker Weight Indicators. The rugged Sensater strokes like a piston, but has no friction-causing piston-rod or packing. It always sends accurate, no-lag, hydraulic signals to the drilling-control instrument. Write Martin-Decker, 3431 Cherry Ave., Long Beach 7, Calif., Dept. D-2.

MARTIN-DECKER CORP.

HOME OF THE WEIGHT INDICATOR — LONG BEACH, CALIFORNIA

for WATER FLOODING AND SALT WATER DISPOSAL



TYPE VTE-2

WORTHINGTON

Vertical Triplex Single Acting

PLUNGER PUMP

Ceramic interchangeable plungers and flanged suction and discharge connections make this Worthington VTE-2 Pump ideal for salt water disposal and secondary recovery in oil fields . . . 5" stroke; roller crank shaft bearings; double-ported valves; individual valve covers; complete automatic oil system . . . Bore Sizes up to 3½"; Capacities up to 7710 BPD; Pressures up to 2700 PSI . . . Stock and Parts carried in Houston, for shipment through Oil Field Distributors.

Descriptive Bulletin W-215-82 Sent on Request

A. M. LOCKETT & COMPANY, LTD.

HOUSTON — NEW ORLEANS — DALLAS

Anadarko basin. The northern boundaries of the basin are nebulous.

Sinclair Oil & Gas Co. 1 Lips opened the basin in 1949, marking the beginning of present-day activity. The well was plugged and abandoned after 1 year. The oil congealed at 80°, making production difficult. Gulf Oil Corp. 1 Harbough found Morrow gas production in Ochiltree County. This well also was abandoned later, but it stimulated new interest in the region.

Pennsylvanian rocks in the Hugoton region fall into three provinces—basin, embayment, and near-shore to continental.

. . . Difficulties in exploration. (1) Abnormally low pressure (445 psi. virgin rock pressure). (2) Lost circulation—now overcome by experience. Drilling costs have decreased as much as $2.00 per foot in the last 2 years.

. . . Stratigraphy. Old shallow production in the Texas Panhandle is in the Permian Wolfcamp dolomite along the ridge of the buried Amarillo Mountains. Hugoton field also has Wolfcamp gas. Gulf Oil Corp. opened Quinduno field in Roberts County a few years ago in the Wolfcamp brown dolomite.

The pre-Pennsylvanian is relatively unexplored. Most wells stop below the top of the Mississippian. There is one Ellenburger well in the Panhandle producing. The Siluro-Devonian is only about 100 ft. thick—is tight and shaly. Some Simpson sands have been found, but are disappointing. The Viola is 200-300 ft. thick—no shows and no production in this lime. The Hunton is about 100 ft. thick. Some slight gas shows have been reported, but there is no production from the horizon. Lips was the only Mississippian producer in the Panhandle. The well was core drilled from the Mississippian down to the Ellenburger before being abandoned. The entire section proved to be tight, although the structure was "terrific." Last year commercial Mississippian production was opened in the Panhandle's Hansford County area.

There are at least a dozen Pennsyl-

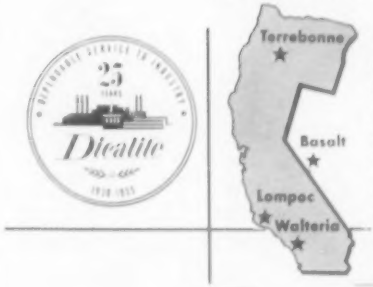
1930
Quarrying for first plant—Walteria

a quarter of a century separates these DICALITE pictures

1955
Fourth Processing Plant—Lompoc

They didn't continue very long—the horse-and-wagon, hand-quarrying methods of our early days. For Dicalite was founded on the idea of *development*, of promoting new uses for that little-known (in 1930) material, diatomite, and working out improved processing methods.

The succeeding 25 years have, we believe, proved the soundness of that idea. Today diatomite . . . also called diatomaceous silica, diatomaceous earth or D.E. . . . has important uses in more than 200 industries, and Dicalite has helped in the pioneering and development of many of these uses. Dicalite products, which now number more than 50, have a valued place in the brewing, pharmaceutical, chemical, sugar, food, paint, paper and other large industries, as filteraids, fillers, insulation and in other capacities.



And Dicalite itself has grown—because of this basic idea of development—from 1930's one deposit, one plant, to 1955's four processing plants and deposits in three states. Four locations, four plants, served by four different railroad systems, insure a continuing, *dependable* supply of the diatomaceous materials upon which many industries rely.

Dependable GLC GREAT LAKES Dicalite DIATOMACEOUS MATERIALS

DICALITE DIVISION • Great Lakes Carbon Corporation, 612 So. Flower St., Los Angeles 17, Calif.

When It Comes to Coupling Pipe

It Pays to Know the Facts About

GUSTIN gb BACON

What's the Big Advantage in G-B Couplings?

G-B couplings eliminate flanging, threading, welding. No special tools or skill required to install them. Result: Tremendous savings in installation time.

How Else Do They Save Money?

All G-B couplings are reclaimable. Also, with G-B couplings, every joint is a union. Makes it easy, inexpensive to take a line apart.

How Much Abuse Can They Take?

Because they permit end pull up to 102,000 and misalignment up to 7°, G-B couplings absorb shock, vibration, ground motion, expansion, contraction, etc.

Are They Recommended for Permanent Installations?

Thousands and thousands of G-B couplings installed years ago on permanent lines, buried and exposed, are still giving completely satisfactory service.

What Kind of Lines Are They Used On?

Oil, water, chemicals, gases, air, processing fluids, abrasive materials. Permanent or temporary lines, surface or buried, vacuum, suction or discharge, vertical or horizontal.

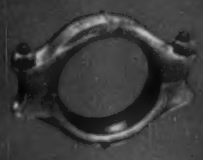
ROLAGRIP

for plain end pipe, 1½" to 12", 1000 p.s.i.

GRUVAGRIP

for grooved pipe, ¾" to 10", 1000 p.s.i.

GRUVAJOINT



for grooved pipe, 2" to 6", 500 p.s.i.

FITTINGS

for all Gruvagrip and Gruvajoint couplings.

Get GUSTIN gb BACON Couplings at your supply store

GUSTIN-BACON Manufacturing Company

210 W. Tenth St. Kansas City, Missouri

Write today for brochure 55-L containing photos, specifications on all G-B coupling products, including aluminum couplings and fittings for grooved pipe.

vanian sands in the Panhandle. The upper Morrow at 7,000 ft. is the best found to date—some think it's Atoka, but it is easily correlated with the Morrow of Southwest Kansas. The Morrow is erratic, not blanket. Offshore bars are believed to be the origin of the Morrow. It is an attractive prospect, but unpredictable.

The Tonkawa, either lower Virgin or upper Missouri, has produced some excellent gas wells, many with water, however. This sand is also erratic. Some think it to be lower Douglas in age (lower Virgil).

Oklahoma Panhandle . . . The Pennsylvanian rocks in this area fall into three provinces (see map).

1. Basin rocks . . . dark limestones and shale.

2. Hugoton embayment-shelf facies . . . light limestones, dolomite, and sandstones.

3. Near-shore to continental facies in extension of Dalhart basin.

The Mississippian section is very similar to Kansas . . . Chester, Meramec, Kinderhook. Structure in the Oklahoma Panhandle is less important than facies and porosity changes.

. . . Atoka. Correlated from Kansas—The Atoka can be distinguished from the Morrow. Thickest Morrow section is in Texas County. Morrow isopach shows the Dalhart basin of Northwest Texas extending north into Oklahoma out of the northeastern corner of Dallam County, Texas. The Atoka grades upward into overlying Cherokee with no definite break except in western Cimarron County. The Atoka becomes increasingly arkosic westward toward the Sierra Grande uplift—no arkose noted in Morrow, which becomes tight and siliceous.

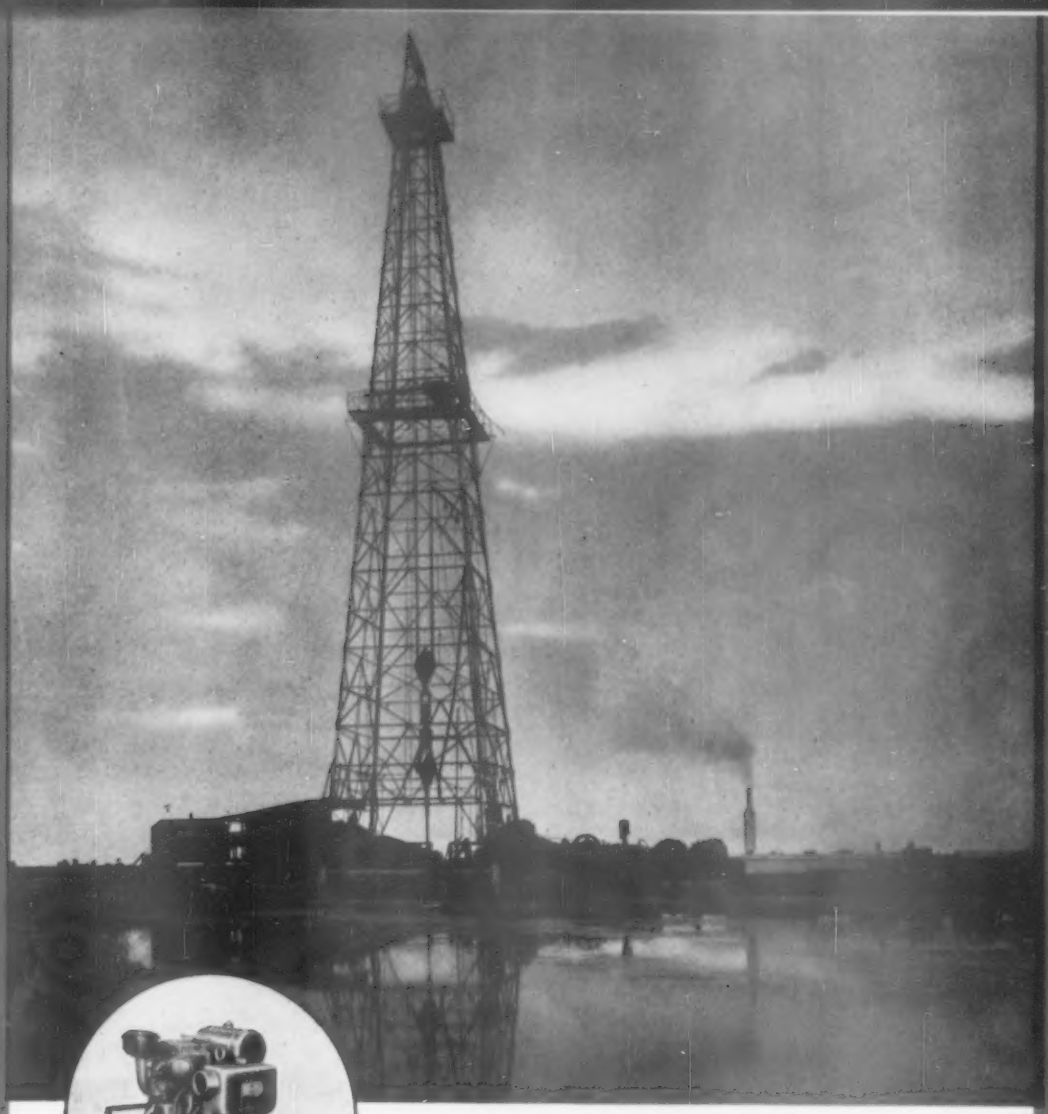
. . . Des Moines. The Des Moines Series consists of the Marmaton, Oswego, and Cherokee. The Des Moines is made up of thick limestones and shales.

. . . Missouri. The Missouri (Canyon) overlies the Des Moines. It exhibits the same facies provinces and thickening in the same places as the Morrow.

. . . Virgil. The Virgil (Cisco) Upper Pennsylvanian is principally shales—800 ft. or more in upper Panhandle to 1,200 ft. thick in southern part.

. . . The Permian Wolfcamp. The Wolfcamp has production in the Council Grove and Chase Group.

Southwest Kansas . . . There is little regional structure evident in Southwest Kansas except for the Hugoton embayment. Local noses are numerous, as well as small closures. The Sierra Grande uplift affected regional structure in this region.



Dawn to dusk or 'round the clock duty doesn't bother tool pushers who need dependable pumping. They're finding Marlow Self-Primers and Marlow "Mud Hog" Diaphragm Pumps are an important part of their job. For pumping wastes from cellars, or for washing down rigs, brake cooling service, and utility water supply, Marlows can't be beat!

marlows are durable!

Marlows are "old hands" at oil country pumping. They're built to handle the tough jobs in the field efficiently, day in and day out, with little attention and low maintenance. Known for their rugged dependability by majors and independents alike, more and more veteran oil men are making Marlows their *first choice!* Make sure with Marlow . . . get *all* the facts from your Marlow Dealer or write for Bulletin O-53.

MARLOW PUMPS • RIDGEWOOD, NEW JERSEY

Division of BELL & GOSSETT COMPANY

WATERFRAC

NEW DOWELL TREATMENT FOR WATER INJECTION WELLS

Thickened water and sand used to fracture problem formations, increasing well capacity

With Waterfrac*, it is now possible to fracture salt water injection and disposal wells and water supply wells more effectively than ever before. This new Dowell treatment is designed for formations in which use of an oil-base fracturing medium might be undesirable or even detrimental.

Waterfrac treatments use thickened, fresh or salt water as the carrying medium for the sand. Special Dowell equipment is used to prepare the Waterfrac material quickly and easily on the well location.

High concentrations of sand can be used and the size of sand grains may be varied during a single treatment. A fine-grain sand can be used to prop open initial fractures and facilitate the later entry of larger grains. This process greatly reduces the danger of screen-outs. It is also designed to prevent the return of sand to the well bore.

Take advantage now of this new Dowell service to help your wells. Call the Dowell office nearest you, or write DOWELL INCORPORATED, Tulsa 1, Oklahoma, Dept. E-11.

** A Service Mark of Dowell Incorporated*
***Patent No. 2,354,570—licensed only to Dowell Incorporated*

services for the oil industry

DOWELL

A SERVICE SUBSIDIARY OF THE DOW CHEMICAL COMPANY

WEST TEXAS-NEW MEXICO

WEST TEXAS

Another Chain Looms In Ellenburger Trend

Humble Oil & Refining Co. 1 Barrow, 22-4s-T1S-T&P, Ector County wildcat 10 miles north of Odessa, has added another producing structure to the so-called Ellenburger Trend fields.

Most opinion is that Humble's new strike, located 2 miles west and slightly north of the lone producer in Ratliff-Ellenburger pool, is the same structure as that discovery. Top of the Ellenburger in Humble's test was 13,578 ft., or minus 10,554 ft., by samples. Subsea top of the Ellenburger in 1 Ratliff was 10,553 ft.

No. 1 Barrow flowed 69.85 bbl. of oil in 1½ hours on drill-stem test at 13,576-98 ft., and reversed out 87.92 bbl. of 52.4° oil, with no water. Coring showed additional porosity, and a second test was made from 13,598-13,618 ft. On that test oil surfaced in 2 hours and 51 minutes, tanking 80.9 bbl. in 90 minutes. Gas-oil ratio was 718:1. A map showing location is in the news section of this issue.

Sutton Cambrian failure . . . American Trading & Production Co. prepared to abandon its 1-5 Hardgraves, 17 miles east of Sonora in Section 5, BS&F Survey. Sample-top of the Cambrian was 7,090 ft., minus 4,776 ft. Drill-stem tests from 7,082-7,107 ft. developed salt water with no shows.

Andrews County prospect . . . W. L. Pickens and Lawton Oil Co. 1 Bird, northern Andrews County, reported good oil shows in the Devonian. Testing from 12,669-99 ft., recovery in 4 hours was 630 ft. of free oil, 480 ft. of heavily oil and gas-cut mud, and the water blanket partially cut with oil.

Pecos County . . . Forest Oil Corp. 1 White & Baker, 5 miles south of the prolific Tippett - Wolfcamp field, reported gas and distillate on a drill-stem test of the Wolfcamp at 6,619-62 ft. Gas surfaced in 3 minutes, estimated at the rate of 1,300 M.c.f. per day. Recovery included distillate - cut mud, and distillate-cut salt water. Top of the Wolfcamp conglomerate was 6,644 ft., minus 3,642 ft.

SOUTHEAST NEW MEXICO

Pennsylvanian Strike in Eastern Lea County

A Pennsylvanian discovery has been assured for eastern Lea County at Sinclair Oil & Gas Co., Dan and Jack Auld 1 Dean, 35-15s-36e. Location is 5 miles northeast of Lovington, and about the same distance north of similar production in the Lovington area.

Initial drill-stem test, at 11,486-11,510 ft., recovered the water blanket, 9,350 ft. of clean oil and 800 ft. of oil and gas-cut mud. Flowing pressure was 1,250 psi. A second test, at 11,480-11,530 ft., had flowing oil in 45 minutes, estimated at 25 bbl. an hour. Time on the tests was not reported. Operators planned to drill ahead to the Devonian.

ARK-LA-TEX

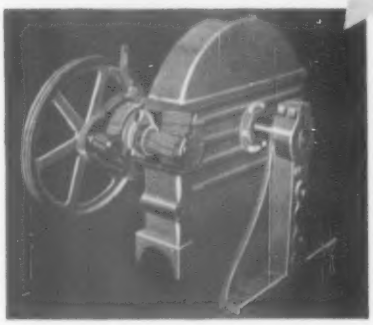
NORTH LOUISIANA

Pettit Oil Discovery Reported At Bethany-Longstreet

A new Pettit oil discovery is reported in the Bethany-Longstreet area of DeSoto Parish, 2 miles southeast of Keatchie, La.

Latex Oil & Gas Co., Inc. 1 Atkinson heirs, NW¼ 35-14n-15w, flowed 13-14 bbl. of oil per hour through 16/64-in. choke from perforations in

JENSEN'S Double Gear Reduction

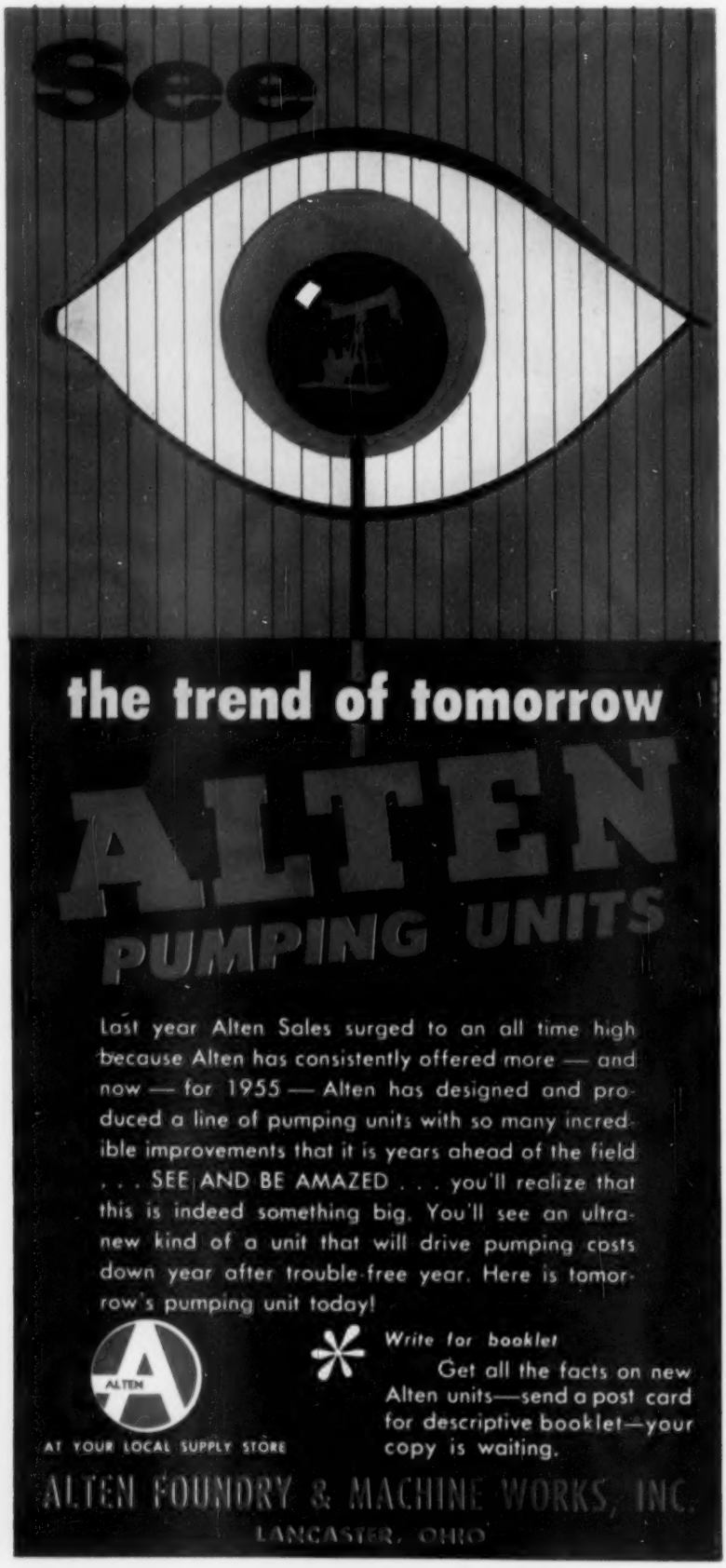


. . . gives you SLOW pumping speeds with HIGH speed prime movers

The JENSEN's Double Gear Reduction is an example of perfect engineering skill. It affords desired slow speeds with high speed prime movers. The second stage main gear is of large diameter, reducing tooth pressure to a minimum and providing flexibility of gear ratios found only in JENSEN JACKS. Change from double to single or single to double with less down time. Ask your dealer about JENSEN JACKS . . . or write us.

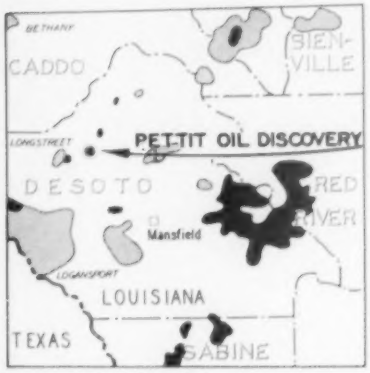
JENSEN JACKS

JENSEN BROS. MFG. CO., INC.
Coffeyville, Kansas, U.S.A.
Export Office:
50 Church St., New York City


See
the trend of tomorrow
ALTEN
PUMPING UNITS
Last year Alten Sales surged to an all time high because Alten has consistently offered more — and now — for 1955 — Alten has designed and produced a line of pumping units with so many incredible improvements that it is years ahead of the field . . . SEE AND BE AMAZED . . . you'll realize that this is indeed something big. You'll see an ultra-new kind of a unit that will drive pumping costs down year after trouble-free year. Here is tomorrow's pumping unit today!
Write for booklet
Get all the facts on new Alten units—send a post card for descriptive booklet—your copy is waiting.
ALTEN
AT YOUR LOCAL SUPPLY STORE
ALTEN FOUNDRY & MACHINE WORKS, INC.
LANCASTER, OHIO

the basal Pettit lime at 6,594-6,600 ft. The well is 2⅛ miles northeast of nearest Pettit wells in Bethany-Longstreet field.

Jones-O'Brien, Inc. and Associates 1 Yarborough-Wemple Unit, W½ SE NE



The Pettit trend in Northwest DeSoto Parish received another discovery. Latex Oil & Gas Co., Inc., has an oil producer in 35-14n-15w.

4-13n-15w, is the closest producer in Bethany-Longstreet field. It was completed in the Page and Rushing zones of the Pettit as a gas-condensate discovery. The Page pay flowed 8,000 M.c.f. of gas and 61 bbl. of condensate per day on open flow. The Rushing zone flowed 4,500 M.c.f. of gas and 21 bbl. of condensate daily. The nearest oil well to this new discovery at 1 Atkinson heirs unit is in Logansport field about 11 miles to the southwest. There is lower Pettit porosity oil production at that field's northwest corner, almost inside Texas.

GULF COAST

TEXAS GULF COAST

Juliff Extension Well Opens Third Pay Zone

Production in the Juliff area, of northern Brazoria County, is being extended southward by a "new-pay" completion in a reentered hole which has been standing since last January as "temporarily abandoned."

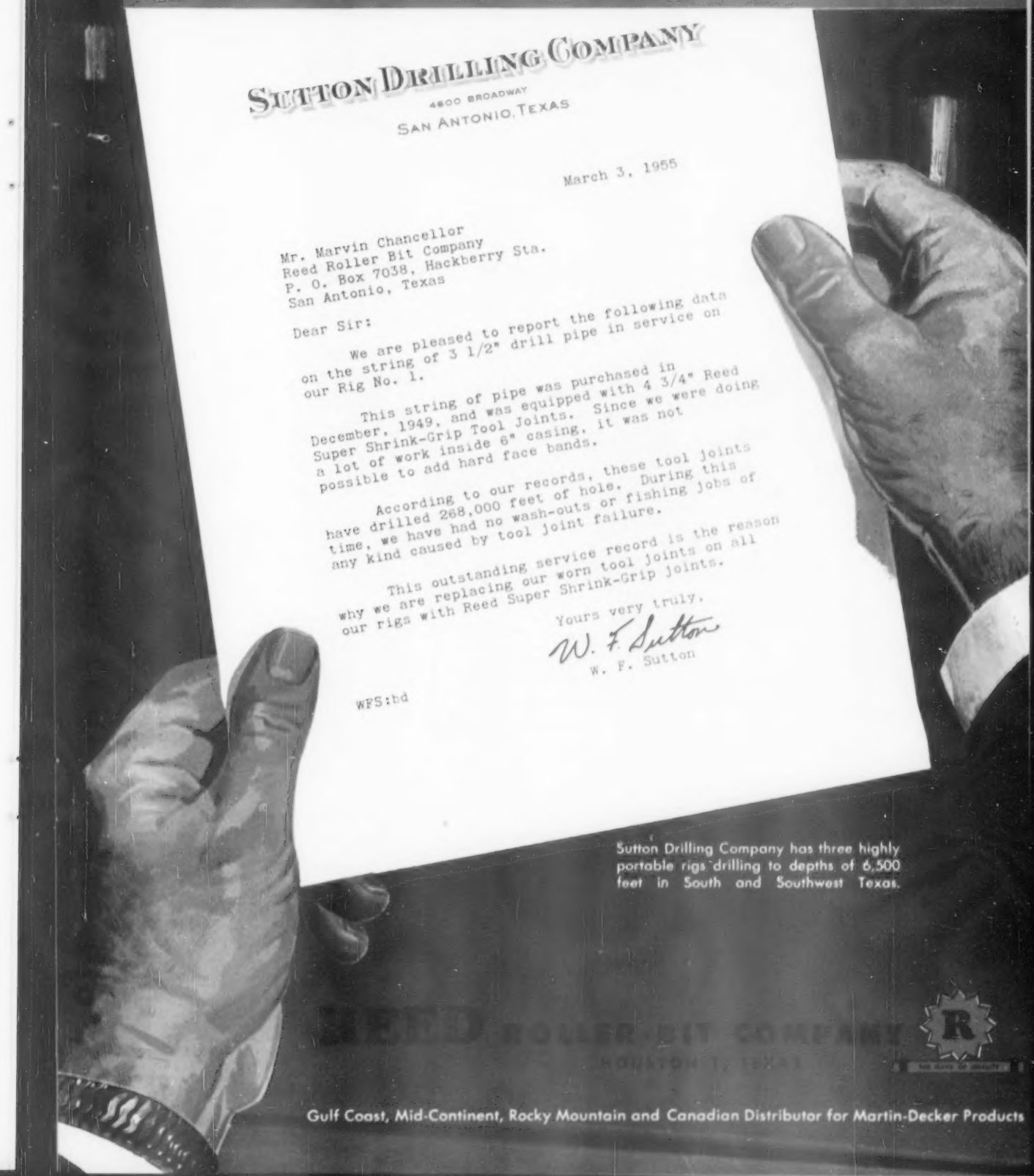
The new completion gives the area its third well, and also its third producing sand.

The hole was drilled by Inca Drilling Co. Operations were suspended last January following a drill-stem at 8,210-11 ft., bottom of the hole, in which 5,000 ft. of water was recovered with about 300 ft. of oil.

Beck Oil Co., of Dallas, present operator, cleaned out and ran casing to 8,200 ft., perforating it opposite a sand interval at 7,668-70 ft., the new pay. Tests through 7/32-in. choke got a flow of 2,103,000 cu. ft. of gas per

HERE'S WHAT WE MEAN WHEN WE SAY:

REED TOOL JOINTS LAST LONGER!



SUTTON DRILLING COMPANY
4800 BROADWAY
SAN ANTONIO, TEXAS

March 3, 1955

Mr. Marvin Chancellor
Reed Roller Bit Company
P. O. Box 7038, Hackberry Sta.
San Antonio, Texas

Dear Sir:

We are pleased to report the following data on the string of 3 1/2" drill pipe in service on our Rig No. 1.

This string of pipe was purchased in December, 1949, and was equipped with 4 3/4" Reed Super Shrink-Grip Tool Joints. Since we were doing a lot of work inside 6" casing, it was not possible to add hard face bands.

According to our records, these tool joints have drilled 268,000 feet of hole. During this time, we have had no wash-outs or fishing jobs of any kind caused by tool joint failure.

This outstanding service record is the reason why we are replacing our worn tool joints on all our rigs with Reed Super Shrink-Grip joints.

Yours very truly,

W. F. Sutton

W. F. Sutton

WFS:bd

Sutton Drilling Company has three highly portable rigs drilling to depths of 6,500 feet in South and Southwest Texas.

REED ROLLER BIT COMPANY
HOUSTON 11, TEXAS

Gulf Coast, Mid-Continent, Rocky Mountain and Canadian Distributor for Martin-Decker Products

day with condensate recovery of 20.68 bbl. per million cubic feet. Pressure gaged 2,767 psi. Gravity of the fluid was 57.8°.

Open-flow potential is calculated at 120,000,000 cu. ft. of gas daily.

The area's discovery well, completed by Lenoir M. Josey, Inc., in January 1953, produced oil from sand at 8,198-8,203 ft. Josey's second well, the only other producer until now, was completed the following June in a 7,450-ft. oil sand.

The area is near the Fort Bend County line about 4 miles southwest of Arcola. Location of the new well is in the Francis Bingham Survey.

Second Producer Confirms Calhoun County Discovery

Layton Brown's recent oil discovery northwest of Olivia, 10 miles northeast of Port Lavaca, in Calhoun County, is being confirmed by a northwest offset well drilled by Southern Minerals Corp. and Seaboard Oil Co., joint operators.

The new well, 1-A Traylor, in the Juan Maldanada Survey, flowed at the rate of 8 bbl. of 39°-gravity oil per hour while testing through 9/64-in. choke. It had a gas-oil ratio of 581 cu. ft. per barrel with pressure of 1,025 psi. on the tubing.

Casing, cemented on bottom of the hole at 8,351 ft., is perforated at 8,326-30 ft. Brown's discovery well is perforated at 8,327-31 ft.

SOUTHWEST TEXAS

Good Gas Flow Recorded By Hidalgo Discovery Well

Forest Oil Corp.'s recently completed gas-condensate discovery well 4 miles northwest of Hargil, in eastern Hidalgo County, flowed at the rate of 5,000,000 cu. ft. of gas per day on open-flow potential tests last week. Condensate recovery was in the ratio of one barrel per 83,600 cu. ft. of gas. Gravity of the condensate was 60.2°. Shut-in pressure gages 3,210 psi. Production is from Frio sand, perforated at 8,178-90 ft.

The well, 1 Schaleben et al, opens Sal Dey Rey field. Location, in Las Mestenas, Pititas, y la Abra Grant, is 3½ miles southwest of the one-well La Jara gas field.

Zapata Gets New Gas Area

Stanolind Oil & Gas Co. has a small gas-discovery well 17 miles west of Zapata, in Zapata County, on Rio Grande. Its 1 Vela, in Porcion 46, testing perforations at 7,482-7,506 ft., flowed at the rate of 468,000 cu. ft. per day through ½ to ¾-in. chokes.

SOUTH LOUISIANA

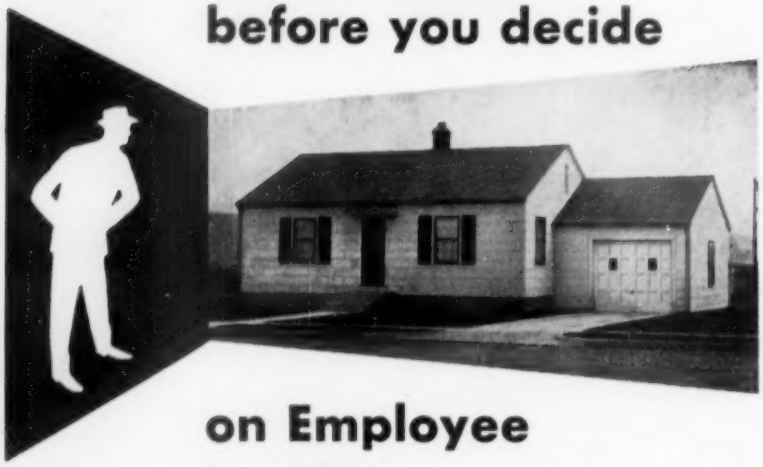
Deeper Sand Produces in New Thornwell Discovery

Pan American Production Co. and Austral Oil Exploration Co., Inc., joint operators, have uncovered a deeper high-pressure gas-condensate sand in the Thornwell area, on the Jefferson Davis-Cameron parish line.

The new pay, perforated at 12,778-

Location (arrow) of Pan American and Austral deep, high-pressure gas-condensate discovery in Thornwell area in Jefferson Davis Parish.

See us FIRST before you decide



on Employee housing . . .

MANUFACTURERS OF SPECIAL MILLWORK: DISTRIBUTORS OF CURTIS WOODWORK, JOHNS-MANVILLE BUILDING MATERIALS

Is it more convenient to house your employees in city homes? How about building conventional houses near your operations? Will trailer camps fill the bill?

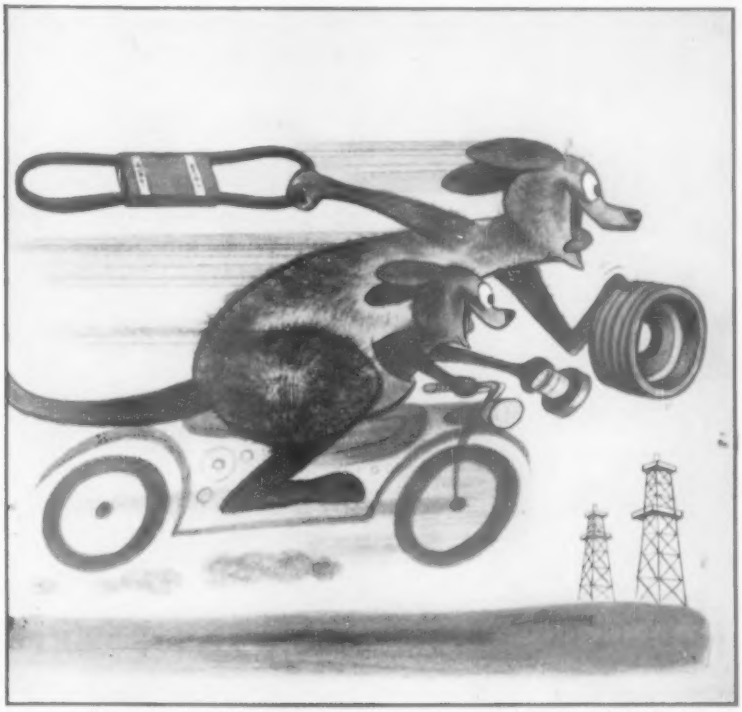
Before you decide on any housing plan, our almost 40 years of employee housing experience should be of value to you. You will be under no obligation to hear our convenient, low cost plan for housing both employees and equipment. Write for information today.

STURDYBILT PREFABRICATED, DEMOUNTABLE HOUSES

SOUTHERN MILL & MANUFACTURING CO. • TULSA, OKLAHOMA

STURDYBILT HOUSES COMPLY WITH COMMERCIAL STANDARD CS 125 OF THE NATIONAL BUREAU OF STANDARDS FOR PREFABRICATED HOMES

When we say quick delivery, we mean *quick delivery!*



"Here comes your Worthington QD Sheave — the original two-piece design."

We're talking about the speedy service you get when you order a Worthington QD sheave or V-belt from your local Worthington distributor (or supply store). He's got a dollar-saving way of getting you exactly what you want — *when you want it.*

QD, by the way, stands for Quick Detachable, which the Worthington sheave certainly is. The original two-piece sheave, it's also easy to get on and stays *tight* on the shaft.

Ask about Worthington QD sheaves and belts next time you stop by your supply store. MV.5.8

WORTHINGTON

Buy These Worthington Standard Products From Your Local Distributor

COMPRESSORS • MULTI-V-DRIVES
VARIABLE SPEED DRIVES • PUMPS

Going in the HOLE?

USE

GEOLOGRAPH

Time is money on a drilling well! You save *both* with Geograph because its foot-by-foot drilling record helps do *A BETTER JOB IN LESS TIME!* That's why you always save when you log as you drill with Geograph.

GEOLOGRAPH
MECHANICAL WELL LOGGING SERVICE
P. O. BOX 1291 • OKLAHOMA CITY 1, OKLAHOMA

Farmington, New Mex. • Liberal, Kan. • Oklahoma City, Okla. Bakersfield, Cal. • Abilene, Houston, Odessa, Lubbock and Wichita Falls, Tex. • Shreveport, and Baton Rouge, La. • Casper, Wyo. Glendive, Mont. • Sterling, Colo. • Edmonton, Alberta

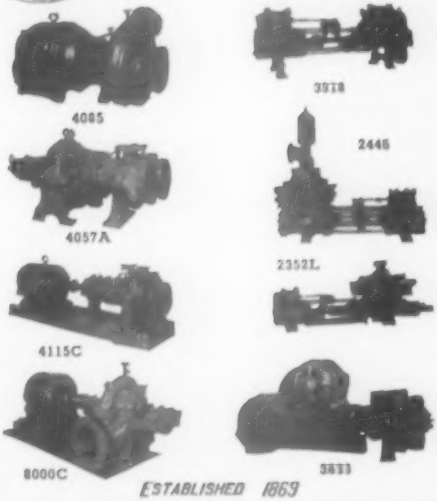
---

DEAN BROTHERS PUMPS INC. INDIANAPOLIS IND. PUMPING MACHINERY

PUMPS

CENTRIFUGAL
RECIPROCATING

BUILDERS OF OUTSTANDING PUMPS
Since 1869



ESTABLISHED 1869

DEAN BROTHERS PUMPS INC.
INDIANAPOLIS IND.
323 W. TENTH ST.

88 ft., is about 3,100 ft. below sands previously productive in the field. Its discovery well, I Benoit, in 25-11s-5w, northwest of previous production, in Jefferson Davis Parish, flowed at the rate of 6,800,000 cu. ft. of gas per day through ⅞-in. choke.

Gas carried a high condensate content, but abnormally high flowing pressures prevented a gage of liquid volume. Flowing pressure increased from 8,500 psi. to 9,500 psi. before the well was shut in.

Operators will keep the well shut in pending further developments, and, with hole loaded with water, pressure is 6,200 psi.

Hole was carried to 12,828 ft. Further drilling was prevented by high pressures and circulation difficulties. Deeper exploration will be attempted in the operators' next well to be started soon.

The Thornwell area, in which Pan American and Austral have jointly owned leases covering more than 8,000 acres, is about 7 miles southwest of Lake Arthur field, where Union Sulphur & Oil Corp. is developing major gas and condensate reserves in the deep Camerina sands.

You Get a Top Job with a THOMPSON!

That's what drillers and profit-wise operators everywhere are saying. They're using the Improved **THOMPSON** Vibrating Shale Separator with Sample Machine. It's an important part of their standard equipment.

Wells are fed a steady flow of *clean mud* with a **THOMPSON** because its vibrating action effectively removes abrasives and shale from drilling muds. The Sample Machine supplies foot-by-foot specimens of formation cuttings. It's standard on all **THOMPSON** Separators unless otherwise specified.

Every **THOMPSON** Separator is field-proven. Performance, as specified, is guaranteed, economy is a reality, and its cost fits your budget.

Write for Free Illustrated Folder.

Manufacturers also of the famous THOMPSON Self-Motivating Rotating Shale Separator and Sample Machine.

THOMPSON TOOL CO.
IOWA PARK, TEXAS

SOLD THROUGH SUPPLY STORES EVERYWHERE

EASTERN INTERIOR

ILLINOIS

Oil Production in Illinois Continues to Increase

Illinois produced an average of 217,000 bbl. of oil per day in April, according to John C. Frye, chief of the Geological Survey Division of the Department of Registration and Education. This is an 11-year high in production, exceeding March 1955 by 5,000 bbl. per day and April 1954 by 37,000 bbl. daily. At the end of the month daily production was above 221,000 bbl. and was still increasing.

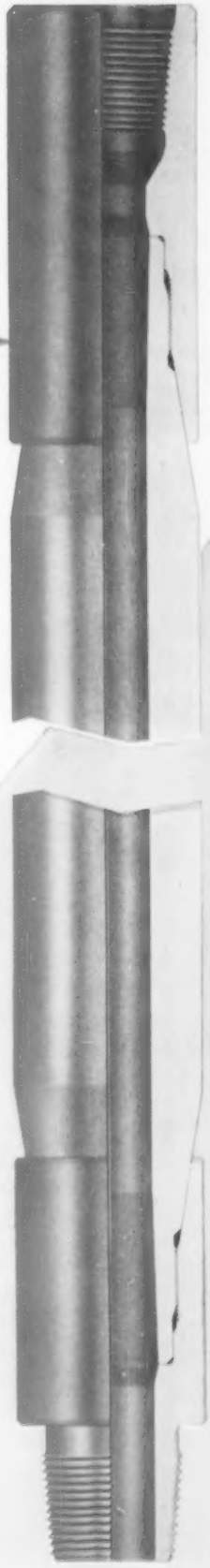
According to the April drilling report, to be released May 13, no new pool was discovered in April. Extensions were completed to eight pools: Old Ripley in Bond County, Hill East in Effingham County, Junction North and Omaha in Gallatin County, Edinburg West in Christian County, and Harrisburg, Omaha South and Cantrell Consolidated in Saline County. Six new pays in pools were discovered during April, most of them by the extension wells drilled during the month. New pays include the Waltersburg sandstone in the Harrisburg pool in Saline County, the Cypress sandstone in the Hill East pool in Effingham County and the Irvington East pool in Jefferson County, the Aux Vases sandstone in the Omaha pool in Gallatin County and Omaha South pool in Saline County, and the Rosiclare sandstone in the Junction North pool in Gallatin County. In Pike County a Silurian gas well was completed in April near the town of Fish Hook, and a second gas well was being completed at the end of the month.

A total of 305 wells were completed in Illinois in April (a 5-week period), or 61 per week as compared with 59 per week a year ago. There were 173 oil wells and 1 gas well completed during the month.

The Clay City Consolidated pool led in drilling activity for the month with 47 producing wells and 8 dry holes completed. The Eldorado Consolidated pool was second with 17 oil wells and 4 dry holes completed. White County still leads in both the total number of wells drilled and the number of successful wells, with Saline County second in both classifications.

In Gallatin County, 1 mile north of Ridgway in SE NE NE 24-8s-8e, Heppard 1 Kanady is a Palestine discovery. On a drill-stem test at 1,752-60 ft. the

LONGER LIFE
from your Drill Collars with...
ROL·FLEX
Replaceable End Drill Collars!



The American Iron Rol-Flex Drill Collar with Straight Grip Drill Collar connectors enables you to replace worn or broken connections right at your rig with no loss of collar length, no trucking expense for re-threading and no reduced bit weight while waiting for shopped collars.

The Rol-Flex Drill Collar Tool Joint is designed especially for use on a drill collar and uses the Straight Grip threads with the famous 4 points of seal. The critical last engaged thread area on the drill collar incorporates a cold working process from which is derived the name "Rol-Flex."

The Rol-Flex process on this last engaged thread area removes the most dangerous breakage point on the drill collar by eliminating the fatigue notch where stresses are normally concentrated and dissipates the stresses over a greater area.

Important Features:

- Installed at your rig.
- Tool joint connectors designed for optimum Drill Collar usage.
- No loss of collar length.
- Removal of "Fatigue Notch" from collar.
- Cold working "(Rol-Flex)" of undercut on Drill Collar.

AMERICAN IRON & MACHINE WORKS CO. · MANUFACTURERS OF · OIL FIELD EQUIPMENT · A · REG. U.S. PAT. OFF. · OKLAHOMA CITY U.S.A. ·

AMERICAN IRON & MACHINE WORKS CO.

OKLAHOMA CITY, OKLA. — BOX 1177

well flowed clean oil. Testing is due at 1,730-60 ft.

WESTERN KENTUCKY

In Henderson County Kennard Oil Co. & Associates have an Aux Vases lime discovery at the 1 C. W. Cavanah, 10-Q-24. The operator has set casing for testing at 2,202-09 ft. A test at 2,199-2,210 ft. gassed in 9 minutes, flowing clean oil in 23 minutes. The discovery well is 2 miles from production and 6 miles from the nearest Aux Vases lime wells.

● In Christian County, 3 miles southwest of Apex in 3-G-26, Luther McIntosh 1 Kirby Martin is flowing by heads at the rate of 200 bbl. per day from the Jackson sand at 532-551 ft.

GREAT LAKES

MICHIGAN

Merrill Drilling Co. 2 Wilson, NE NE NW 6-12n-8w, Cato Township, Montcalm County, which will be rated either as a new pool opener or an important extension of the older Cato Dundee-Reed City zone pool, was under test in objective pay after a small, 250-gal. clean-out acid treatment. On the basis of early tests after this acidization, well appeared to be good for about 25 bbl. of oil a day. Considerable water is being recovered with the oil, but this is typical of wells in Cato pool further to the east. The 2 Wilson was drilled to 3,552 ft., total depth. Pay objective showed from 3,551 ft. Well filled about 1,000 ft. with fluid natural in 4 hours.

● Although it is not considered to be commercial, a Salina dolomite gas show at McClure Oil Co. 1 Gumper, SE NE SW 19-4s-15w, Liberty Township wildcat, Jackson County, appeared to be very significant and interesting. The gas was reported on a 4-hour and 40-minute drill-stem test run at 2,224-48 ft. Gas showed to the surface in 33 minutes, and was estimated at 15,000 cu. ft. Gas was burned at the wellhead for about 4 hours during the test. This is the same zone which carried oil, with a large amount of water on another southeastern Michigan wildcat, Aurora Gasoline Co. and McClure Oil Co. 1 Kintigh, NE NE SE 20-3s-3w, Concord Township, Jackson County. The show at the 1 Kintigh is the first recorded show of oil and gas from this upper Salina dolomite in Michigan.

Annual Field Trip

The Michigan Geological Society annual field trip will be June 17-19. The trip will cover the Silurian section along the Niagaran escarpment between Hamilton, Owen Sound, and Bruce Peninsula, Ontario.

The field trip will begin officially Saturday morning with the assembly point at Jolly Cut and Concession Street in southeastern Hamilton, Ontario. All reservations should be mailed to Robert Acker, 740 Durant Street, Lansing 15.

APPALACHIAN

WEST VIRGINIA

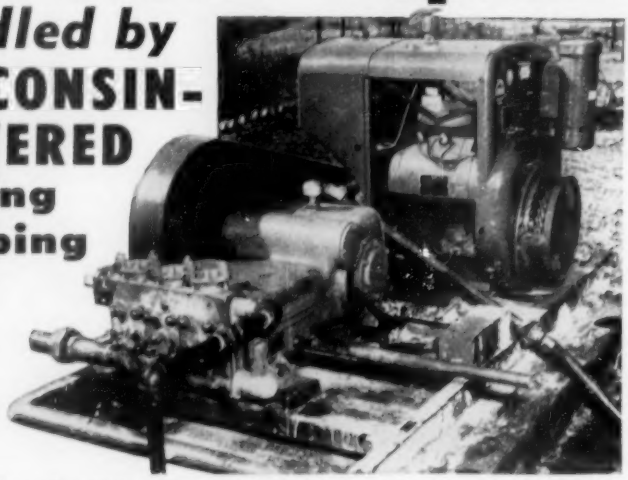
In Middle Fork district, Randolph County, West Virginia, P. C. McKenzie Co. 1 Elk Horn Coal Corp., deep Oriskany sand wildcat test, elevation 2,289 ft., was dry, Onondaga 6,870 ft., chert 6,897 ft., Oriskany sand 7,105-7,210 ft., light show of gas below this formation at 7,273 ft. Total depth 7,359 ft.

● Circleville district, Pendleton County, Columbian Carbon Co. 2-1203 U.S.A. went through the Oriskany sand at 6,392 ft. A show of gas was had at 6,263 ft., but would not test. Drilling is at 6,471 ft. in a white sand topped at 6,400 ft.

OHIO

An oil pool is developing all along the south edge of Gnadenhutten pool

Salt Water Disposal
handled by
WISCONSIN-POWERED
Deming Pumping Unit



The problem of getting rid of salt water after it has been separated from the oil, without polluting surrounding land, streams or endangering livestock, has been successfully solved with this heavy-duty pumping unit.

This specially designed pump, made of special materials, best suited to this type of operation, will handle 1200 barrels of oil field brine per day at 1,000 lbs. pressure, forcing the water back into the porous formation. This unit is being used by leading oil producers and is giving a very good account of itself, according to reports from the field.

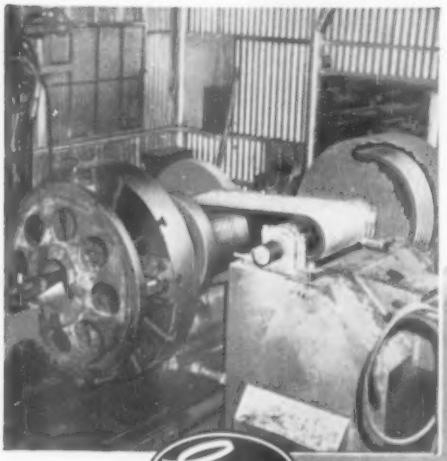
A heavy-duty V-type 4-cylinder Wisconsin Air-Cooled Engine provides the steady-going, completely dependable power that keeps the pumping unit going day in and day out, with an absolute minimum of human attention and servicing. Tapered roller bearings at both ends of the crankshaft carry the load smoothly and provide fullest protection against bearing failure. Extremely efficient AIR-COOLING solves the cooling problem under all weather conditions, from sub-zero to 140° F.

You can't do better than to speccify WISCONSIN ENGINE POWER for *your* oil field equipment.

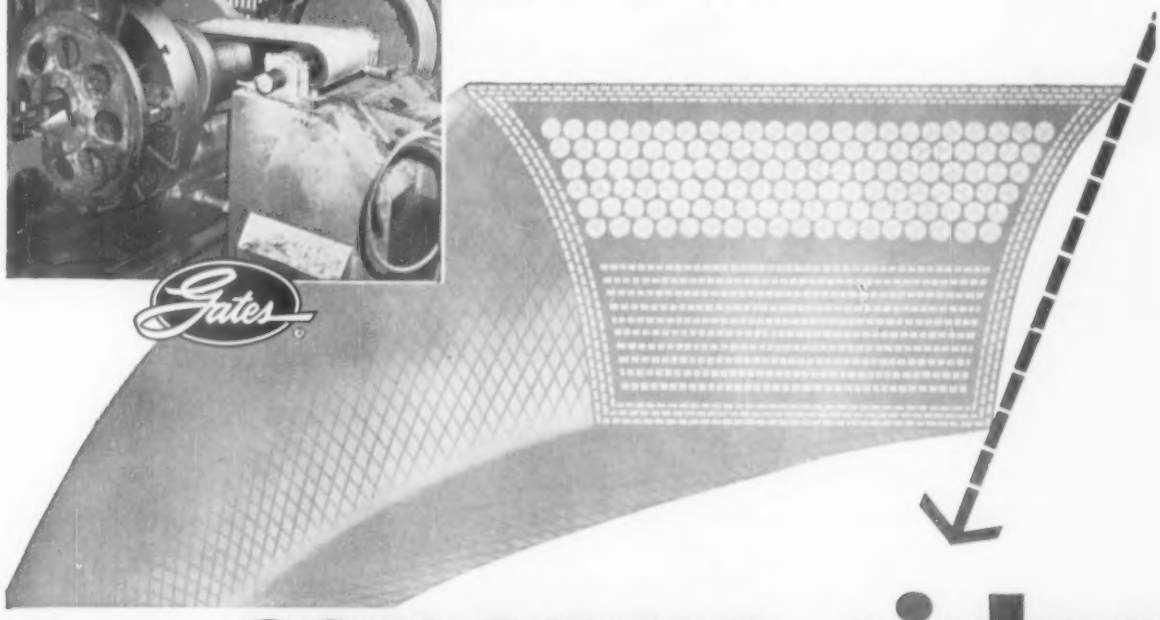
WISCONSIN MOTOR Corporation
MILWAUKEE 46, WISCONSIN
World's Largest Builders of Heavy-Duty Air-Cooled Engines

WRITE TO HARLEY SALES CO.
619 SOUTH MAIN STREET • TULSA, OKLAHOMA
3420 McKINNEY AVENUE • HOUSTON, TEXAS
505 SOUTH MAIN STREET • WICHITA, KANSAS
OIL FIELD DISTRIBUTORS FOR WISCONSIN ENGINES AND ALL TYPES OF UTILITY UNITS

A 8418-½I



The smooth, positive flow of power transmitted through Gates Vulco Ropes enables this large engine lathe to handle quickly and efficiently many tough oil field repair jobs.



How concave sides cut V-belt costs!

Plants all over the world have made this discovery: Gates Vulco Ropes—the V-belts with *concave sides*—wear longer; cost less per year of service.

Here is the interesting reason why:

When the Gates Vulco Rope is bent around the sheave, the *precisely engineered* concave sides (Fig. 1) fill out and become straight (Fig. 1-A). Thus the belt makes full, uniform contact with the sides of the pulley. You get sure pulling power and *even distribution of wear.*

Longer wear saves not only on replacement costs; it also saves the cost of down-time... keeps equipment producing.

It's easy to prove to yourself the value of concave sides

Simply bend a straight-sided belt (Fig. 2) and *feel* the bulge at the sides around the bend. You will quickly see why the bulging sides prevent an even fit in the pulley groove (Fig. 2-A). Uneven contact shortens belt life...increases belt costs.

Cut belt replacement time and costs...specify Gates Vulco Ropes—the V-Belt with *concave sides* (U.S. Pat. 1813698). The Gates Rubber Co., Denver, Colorado—*World's Largest Maker of V-Belts.*

Gates Engineering Offices and Distributor Stocks are located in all industrial centers of the United States and Canada, and in 70 other countries throughout the world.

TFA-30-A-G

GATES VULCO ROPE DRIVES

faster

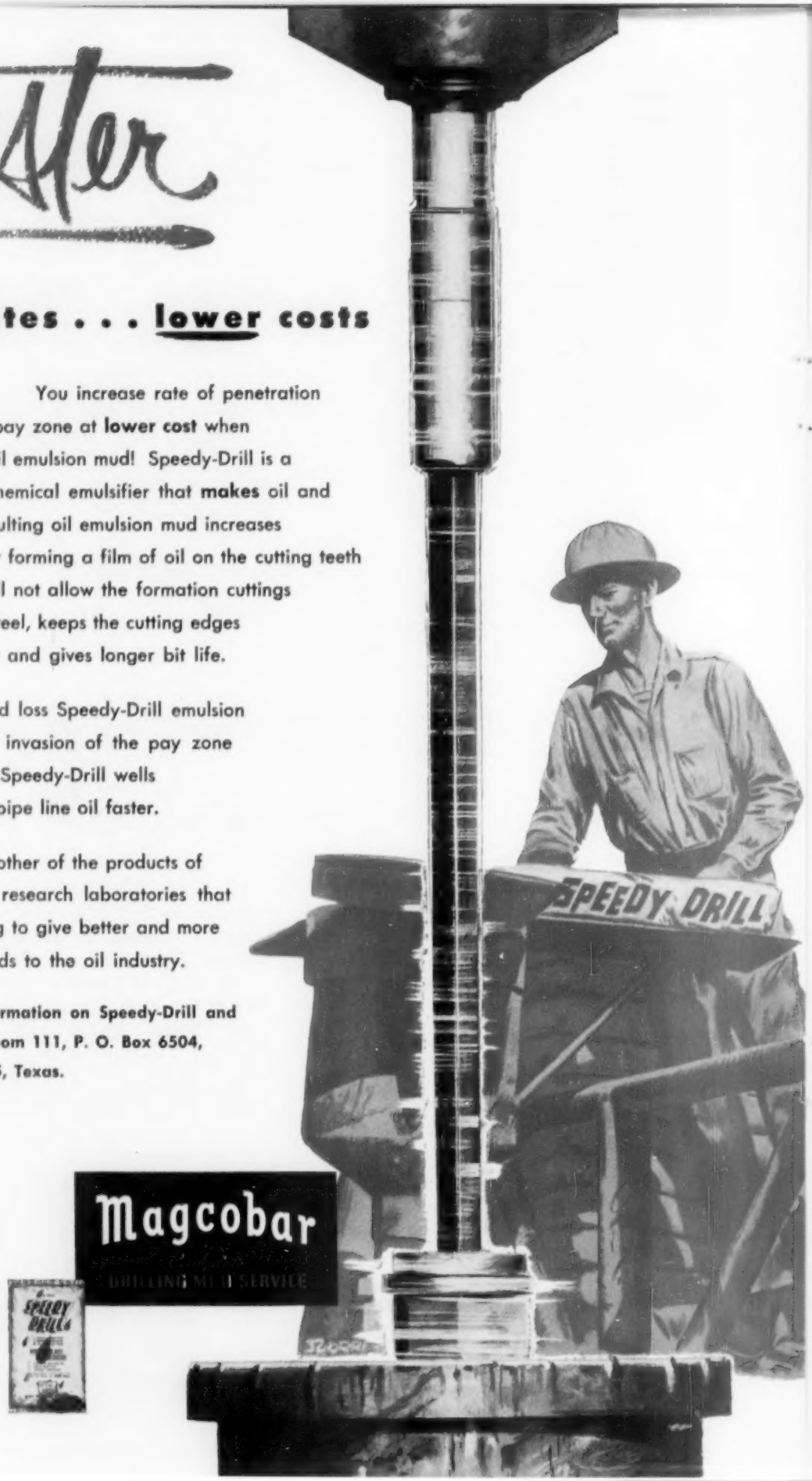
drilling rates . . . lower costs

You increase rate of penetration and protect your pay zone at **lower cost** when Speedy-Drill is in the oil emulsion mud! Speedy-Drill is a formulated chemical emulsifier that **makes** oil and water mix. The resulting oil emulsion mud increases drilling rates by forming a film of oil on the cutting teeth of the bit. This film will not allow the formation cuttings to adhere to the steel, keeps the cutting edges much cleaner and gives longer bit life.

Low fluid loss Speedy-Drill emulsion muds reduce filtrate invasion of the pay zone to a minimum. Speedy-Drill wells clean up and produce pipe line oil faster.

Speedy-Drill is another of the products of Magcobar's advanced research laboratories that are constantly working to give better and more economical drilling muds to the oil industry.

For detailed information on Speedy-Drill and its advantages, write Room 111, P. O. Box 6504, Houston 5, Texas.



in Clay Township, Tuscarawas County. Blacksten & Ebersbach 1 Eugene Roth, Section 12, a ½-mile southeast extension, topped the second Berea sand at 1,111 ft. and was finished at 1,124 ft., still in sand. A natural gage of 1,000,000 cu. ft. of gas was drowned out and after putting to pump, the well pumped and flowed 130 bbl. in 29 hours.

● Preston Oil Co. 1 George Riggenbach, Section 29, Milton Township, Wayne County, gaged 150,000 cu. ft. of gas and 25 bbl. natural from Clinton at 3,349-69 ft. The well has only been open 1 hour and 40 minutes after fracturing, but is estimated to make 2,500,000 cu. ft. of gas and 400 bbl. oil.

EASTERN KENTUCKY

On Hell for Certain Creek in Leslie County, United Fuel Gas Co. is testing at its prospective wildcat gas discovery. The 2 Fordson Coal Co. had Mississippian Big Lime 1,555 to 1,799 ft., Corniferous lime 2,330 to 2,457 ft. and Silurian Big Six sand 2,457-77 ft. TD 2,482. Gas shows were encountered in Big lime which after shot showed for 65,000 cu. ft. of gas daily and Big Six which after Acidfrac tested 84,000 cu. ft. of gas daily.

WESTERN CANADA

ALBERTA

Initial Flow Test Reported At Shell Carbon Area Wildcat

Shell Oil Co., on initial flow testing operations at their Carbon area wildcat in southeastern Alberta, has yielded condensate-bearing gas at the approximate rate of 4,000 M.c.f. per day. This discovery was initially reported as a basal Quartz strike and was recently corrected to Glauconitic. The well is 9½ miles west of the proven limits of West Drumheller Devonian oil field and 50 miles northeast of Calgary.

Viking Discovery Seen For Bentley Area

California Standard Co.'s wildcat in the Bentley area of Central Alberta, has been unofficially reported to have flowed oil from the Viking sand. The test, after reaching total depth of 11,557 ft. earlier this year, ran logs and results of the logs indicated that testing was warranted in the Viking.

This well, the 4-5 East Gilbey, LSD 4, 5-31-2w5, is about 4½ miles east of the Seaboard 10-4 Sylvan Lake Viking oil discovery and 20 miles west of Lacombe. Last year the well had been

These Modern Jacks Can Lift Heavier Loads With Less Effort!

These precision built jacks require much less effort to operate than mechanical type jacks because they utilize the hydraulic principle—a pump does the work.

Duff-Norton Hy-Power Hydraulic Jacks, because of this ease of operation, are finding more widespread use in the oil fields for all kinds of heavy lifting and pushing jobs. They are standard equipment on many rig builders' trucks and on drilling rigs.

There are ten Duff-Norton Hydraulic Jacks with capacities from 3 to 50 tons. All models can be equipped with gauges calibrated to show exact weight of load being lifted.

See these time and energy saving hydraulic jacks at your favorite supply store or write the world's oldest and largest manufacturer of lifting jacks for complete specifications. Ask for Hy-Power Hydraulic Jack Bulletin AD16-B, Duff-Norton Company, P.O. Box 1889, Pittsburgh 30, Pa. Canadian plant—Toronto 6, Ontario.

DUFF-NORTON
Jacks

"Giving Industry A Lift Since 1883"

an ACCO product

ACCO's Great New Chain...

ACCOLOY

X-WELD

125

• At last—a chain with welds as strong or stronger than the material . . . welds that won't break when links are bent sharply . . . welds made with two projecting lugs that absolutely prevent kinking.

Accoloy X-Weld 125 Chains hang straight as a die. Every link is perfectly formed!

Accoloy X-Weld 125 Chain has almost countless uses: Slings, bundling, towing, boomer, general utility chains . . . It can be furnished in special analyses and heat treatments. Available in ¼", ⅜", ½", ⅝" and ¾" sizes.

Write the American Chain Division, York, Pa., for descriptive bulletin

The Secret is in the Weld!

This Accoloy X-Weld 125 link was ground and etched to show its big welded area—2½ times the size of welded area possible with other welding processes. This means more than double the security of the weld—and only X-Weld has it!

PATENT APPLIED FOR

ACCO

American Chain Division

AMERICAN CHAIN & CABLE

York, Pa., Atlanta, Boston, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, Portland, Ore., San Francisco, Bridgeport, Conn.

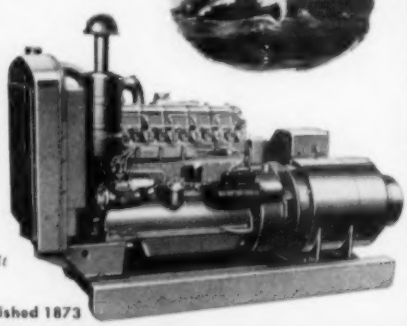
for Better Value

KOHLER Electric Plants

for heavy-duty independent power

Sole supply and stand-by

Diesel models for offshore service include sizes 10 to 35 KW for rig lights, floodlights, power tools; 10 KW models are used for quarter boat lights and galley equipment. Gasoline or gas operated liquid cooled models from 2 to 35 KW for all other rigs. Air cooled portable plants from 500 to 5000 watts for seismograph equipment, geophysical survey trucks. Also automatic stand-by plants for refineries. Write for folder E-14.



Model 35R061, *35 KW, 115/230 volt AC. Diesel. Remote starting.*

Kohler Co., Kohler, Wisconsin • Established 1873

KOHLER OF KOHLER

PLUMBING FIXTURES • HEATING EQUIPMENT • ELECTRIC PLANTS

AIR-COOLED ENGINES • PRECISION CONTROLS

recorded as a gas-condensate discovery in the Mississippian. Sources report that a 10-ft. section was perforated at about 6,100 ft. During 1½ days of production tests the well was reported to have flowed 150 bbl. daily.

Westward Ho Follow-Up Wells Near Completion

The first two follow-up wells to Hudson's Bay Oil & Gas Co.-Oilwell Operator, Ltd., team's Mississippian oil discovery at Westward Ho were nearing completion last week, and according to latest available reports, limit the producing area at Westward Ho to the south and southwest of the light-gravity oil strike.

The first well contacted the Mississippian at a subsea elevation 20 ft. higher than the discovery well, but showed poor porosity in the pay zone; the second follow-up is making hole 32 ft. below the Mississippian top at the oil find still in the Cretaceous horizon.

The discovery well, 1 Westward Ho, made 1,002 bbl. of oil per day during potential tests in the Mississippian. First follow-up to reach the pay zone, 15-5 Westward Ho, LSD 15, 5-33-4w5, ½ mile south of the discovery well, topped the Mississippian high, but on drill-stem test gave only a small recovery of oil and oil-cut mud. Second follow-up well, 3-8 Westward Ho, LSD 3, 8-33-4w5, ⅜ mile southwest of the 1 Westward Ho discovery well, is bottomed at 8,820 ft. and crew is reaming preparing to continue coring for the expected oil pay.

PACIFIC COAST

CALIFORNIA

New Bandini Pool

General Exploration Co. was preparing to complete a Bandini field well as a new pool discovery. After drilling to 8,553 ft., its 9 C.W.O.D. was plugged back to 6,575 ft. for completion in a zone equivalent to the O'Connell of nearby Santa Fe Springs. Present production in this Los Angeles County field is from zones equivalent to the Nordstrom and Buckbee.

New Fillmore Outpost

Standard Oil Co. of California was preparing location for a 1½ mile northwest outpost to its Fillmore field on the outskirts of that Santa Clara Valley community. The new wildcat, 1 Yuba Consolidated Temple Unit in NE SE 29-4n-20w, will join three others

drilling toward the 14,000-ft. sand. Standard had a test 2½ miles northeast of production drilling below 12,100 ft., and a 1-mile west outpost below 14,000 ft. On the southeast flank Richfield Oil Corp. 1 Homburg was drilling below 5,000 ft.

ROCKY MOUNTAIN

COLORADO

Exploration Due in Southeastern Area

A new round of exploration is slated for extreme southeastern Colorado. The extreme northwestern corner of the Hugoton embayment has had an "off and on again" wildcat program for the past 4 years.

So far, the only success has been a small gas pool in Kiowa County and a more significant extension discovery at the Kansas line's Greenwood field in Baca County. Last week Moran Bros. added more hope to the southeastern Colorado search with completion of a new Topeka lime (Pennsylvanian) discovery in Baca County. The 1 Holt flowed 3,075 M.c.f. of gas per day on completion to open a new Pennsylvanian gas field southwest of Kansas' prolific Greenwood field.

Up along the Las Animas arch, which separates the Denver and Anadarko basins, El Paso Natural Gas Co. will drill a remote wildcat, 6 miles southeast of Las Animas in Bent County, Colorado. The 1 Grover Swift, 6-24s-51w, is 70 miles northwest of nearest production (Helfrich field in Kansas). The wildcat will make a try in the Mississippian. In Kiowa County, 20 miles northeast of the town of Lamar, Colo., Warren - Bradshaw Exploration Co. 1 White is making a drill-stem test in the 3,727-44-ft. interval. This wildcat, 29-19s-45w, is contracted to 5,500 ft. in the Arbuckle.

Two Logan County Discoveries Completed

Calvert Drilling Co. and Zoch-Campbell have completed 1 Roper, C SW NE 6-10n-52w for a gage of 240 bbl. of oil per day. The well is a "J" sand producer, with perforations at 5,237-49 ft. The discovery has been named Winston field.

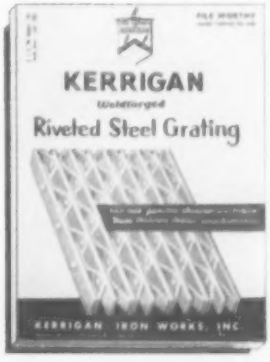
Also in Logan County, J. W. Braden Oil and L. C. Hoover have completed Brachtenbach, C SE NW 26-8n-54w for a flow of nearly 8,000 M.c.f. of gas per day. Production in this well is also from "J" sand. It is within a heavily developed area of the county, and is

A KERRIGAN
Grating for Every Need
A CATALOG
for every Grating
Write for your
Copy NOW!

STEEL
for the 1001 applications where safety and strength come first. Kerrigan Steel Grating is BONDERIZED for corrosion resistance and extra years of life.

STAINLESS and MONEL
non-magnetic steel for the chemical, oil and packing industries . . . for ANY installation where high resistance to heat, acids, chemicals, and corrosion is needed.

TRULY . . .
In both size and type, there is a Kerrigan Weldforged grating for every need. Let our new catalogs prove it to you. Send for the one you think best answers your need (or ask for ALL FOUR if you wish). We will also be glad to send you a desk-size grating sample. Write Kerrigan Iron Works, Inc., General Sales Office, 274 Madison Ave., New York City.



RIVETED STEEL
where it is desired to match existing grating.

ALUMINUM
spark-proof for those whose need is strength AND lightness. Extra safe and strong. Allowable fiber stress 15,000 psi. Modulus of elasticity 10,000,000 psi.

KERRIGAN GRATING
CUSTOM-MADE FOR YOUR JOB AND SAFE—IT'S Weldforged

Roll out collapsed casing and liners with an

Eastman CASING ROLLER

The Eastman CASING ROLLER is the most efficient, effective and economical way to roll out collapsed casing and liners to their original gauge.

The body and rollers of the Eastman CASING ROLLER are made of specially heat treated steel, and the roller ends are tapered to prevent snagging. Continuous rolling surface minimizes friction and vibration. There is also circulation through the tool and around each roller.

These CASING ROLLERS are available in API sizes for casings with inside diameters ranging from 2½" to 17⅜". Other sizes made to order.

Call the Eastman office nearest you. Consult your telephone directory.

Eastman Oil Well Survey Company

LONG BEACH • DENVER • HOUSTON

Export Sales and Service:

EASTMAN INTERNATIONAL COMPANY

P. O. Box 1500 • Denver, Colorado, U.S.A.

only ½ mile east of oil production but is separated from it by dry holes. The well is shut in for outlet.

Weld County Gas Discovery Indicated

Utah Southern Oil Co. recovered gas at the rate of 1,333,000 cu. ft. per day on test of "J" sand at 1 Grabill, C NW SE 29-9n-56w, Weld County. The operator tested the zone 5,829-38 ft. and recovery also included 100 ft. of gas-cut mud. Pipe has been run at the wildcat which is 5 miles north of production in White Buttes field, and west of major production in northeastern Colorado.

NEBRASKA

Two Kimball County Discoveries Gaged

Sure Oil Co. reported a flow of 244 bbl. of oil per day through 17/64-in. choke at 1 Hoskovac, C SE SE 31-14n-57w. The well produced from perforations at 7,075-77 ft. with the producing formation considerably thinner than the usual successful completion in the Denver-Julesburg basin.

Also in Kimball County, Kewanee Oil Co. completed 1 Kimball, NE NE SE 16-16n-54w on swab gage of 215 bbl. of oil per day from "D" sand. Production is from the interval 5,832-47 ft. The operator now has two other wells in the area scheduled.

NORTHERN NEW MEXICO

Southern Union Gas Co. reported a flow of gas at the rate of 21,000 M.c.f. per day from a wildcat southeast of Blanco to set a new gage record for Pictured Cliffs in the New Mexico portion of the San Juan basin. The well is 2-K Jicarilla, SE NW NE 11-25n-5w, Rio Arriba County. It is 3 miles southeast of production in South Blanco pool

MONTANA

Important Williston Basin Completions Near

Two discoveries and an important deep confirmation test in the Williston basin portion of Montana are near completion. The California Co. has run pipe at 1 Grimm, C NE SE 13-32n-49e, in the East Bredette area of Roosevelt County. The well is an apparent Mission Canyon discovery. It was drilled to a total depth of 9,761 ft., but reported no shows below Mission Canyon.

Shell Oil Co. is preparing for final tests of 33-X-21 Unit, NE NW SE 21-14n-55e, in the Gas City Unit, Dawson County. This wildcat flowed at the rate of 17 bbl. per hour from Ordovician and will be completed in that formation. Commercial recoveries were made on drill-stem tests of three other formations, but none of them have been tested since pipe was run.

In Richland County, Sun Oil Co. and Phillips Petroleum Co. are drilling on junk at 1 Dennis Dunneson, SW SE 30-24n-38e, confirmation to the Ordovician discovery at Brorson.

The No. 219 clamp is regularly used on deepest wells. It is designed for any trunnion type pumping unit and will take any size wire line from ¾" to 1¼".

The No. 220 is a combination carrier bar and shock absorber designed for pumping units of limited width and head room.

This Ratigan combination makes an ideal unit—unsurpassed for safety, efficiency and economy of operation.

SOLD THROUGH LEADING SUPPLY STORES

J. P. RATIGAN, Inc.
1213 Santa Fe Ave., Los Angeles 21
Export: National Supply Co., Inc., Export Div.
600 Fifth Ave., New York 20, N.Y.

Write or Wire
for Monthly Stock Lists

- VALVES
- PRESSURE TUBING
- STEEL

Peerless Supply Co., Inc.
L. D. 75 & 76 P. O. Drawer 36-A
Shreveport, La.

SUCKER RODS
Cleanout
TAP and DIES
by Baird

A tool for rechasing damaged sucker rod threads to original thread pitch dimension. The tool can be used when running rods back into the well for removing dirt, sand or scale from box and pin threads before screwing up to insure proper shouldering.

Always Available
Through Your Supply Store

BAIRD MFG. CO.
P. O. Box 380 TULSA, OKLA.

24 HOUR SERVICE
ACME
OIL TOOL COMPANY
- Competent Operators
- Rotary Fishing Tool Service
- Spang Cable Tools • Drill Pipe
- Blow Out Preventers • Rentals
- Complete Oil Field Machine Shop

for
SHAFFER PREVENTER
• Rentals
• Sales
• Service
. . call ACME!

OKLAHOMA CITY
Phone MElrose 7-2426

Affiliated Companies
GREAT BEND FISHING TOOL CO.
Great Bend Ph. 7819
Liberal Ph. 3222
Borger Ph. 1179
WICHITA FALLS FISHING TOOL CO.
Phone 3-1437

GOING FISHING? ACME CALL YOUR FRIEND!

Operators were preparing to perforate and lost a gun in the hole. The well is the third drilled in the field. The first was the Ordovician discovery. The second was a Madison discovery and did not test deeper formations.

New Glacier County Exploration Scheduled

Continental Oil Co. has made location for an 8,500-ft. Madison test in the Milk River area of Glacier County. The well is in the Disturbed Belt fronting the Rocky Mountains through this portion of the state. Location is on acreage of the Blackfeet Indian reservation on which Continental paid a bonus of more than $179 per acre at a 1954 sale.

The wildcat is 1 Tribal, NW NW SW 7-34n-11w. Previous drilling has been done 4½ miles to the southwest where a 1946 failure went to total depth of 10,102 ft. This well was in Madison at total depth. It is the only deep test completed in the United States portion of the Disturbed Belt.

Union Oil Co. of California is drilling below 8,500 ft. at a wildcat 20 miles south of the new Continental location, and Carl Yandt is drilling at 5,500 ft. at another wildcat 100 miles south in Lewis & Clark County. During the past 2 years there has been considerable interest by a number of operators in the prospects of the Disturbed Belt, with some encouragement of a noncommercial nature in the form of shows at Landslide Butte in 1954. Several other wildcats are expected in the general area before the end of 1955.

WYOMING

Park County Discoveries Near Completion

The Texas Co. recovered oil at the rate of 100 bbl. in 16 hours on test of Phosphoria at 1-D State, NE SW NW Lot 60-51n-101w, Park County. The perforated zone 4,311-48 ft. was tested. The wildcat is 2 miles west of production in South Oregon Basin field. It was drilled to Tensleep with no shows reported in that formation.

At another apparent discovery in Park County, Mobil Producing Co. is preparing to perforate at T-61-12-P, NE NW NE 12-56n-100w. Completion is to be in Dakota where drillstem test at 7,940-95 ft. recovered 1,610 ft. of 58°-gravity oil in 1 hour. Flowing pressure was 350-850 psi. Total depth is 9,509 ft., and casing was landed on bottom. Only shows reported below Dakota were minor ones in Phosphoria. This apparent discovery is on the Bearcat Unit, about 4 miles south of South Elk Basin field.

Natrona County Tensleep Discovery Testing

Houston Oil Co. reported swab recovery of 80 bbl. of oil per day at 1 Clark Ranch Unit, C SE NW 6-35n-84w, Natrona County. Production of low-gravity oil is from perforations at 4,678-95 ft. The operator is continuing tests. The well is 5 miles northwest of Pine Mountain field, and is in the eastern portion of the Wind River basin.

BASIN AND RANGE

NEVADA

Nevada Outpost Testing

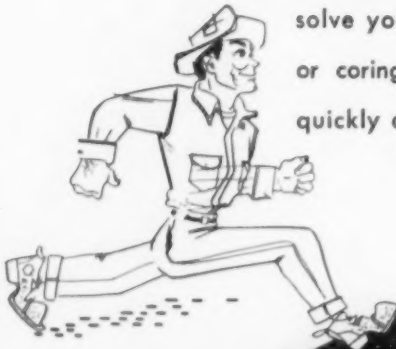
Shell Oil Co. was preparing to run a third formation test in an Eagle Springs Unit, Nevada, outpost after completing two at shallower depths. A 2-hour test at 6,696-6,780 ft. yielded a scum of oil and 250 ft. of mud. Another at 6,789-6,890 ft. resulted in 15 ft. of muddy 20°-gravity crude and 1,491 ft. of gassy mud. The ½-mile northeast extensioner, 58-26 Eagle

"It happens every time I leave for town—I can't help thinking there's something phony about this crew."

What's Doing at D & S?

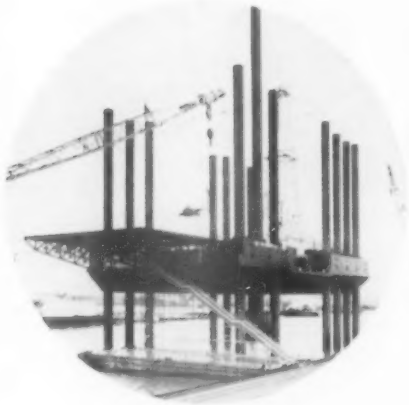
we're busy giving Service

With a world-wide staff of engineers qualified to help solve your drilling or coring problems quickly and at the least cost.



DRILLING & SERVICE
3031 Elm Street
Dallas 1, Texas

TRUCO DIAMOND BITS
AND D & S CORE BARRELS



Copon

For Proven Protection of *VALUABLE OFFSHORE EQUIPMENT*

These offshore platforms, rigs and permanent well head equipment are perfectly protected with Copon against the devastating action of the sea.

Now it can be said that sufficient time has elapsed to prove beyond a doubt that COPON will give years of protection in severe environments which usually break down other coatings in a matter of weeks. The COPON coating systems have been developed after years of research, development and perfection of the coating and coating techniques in close cooperation with industry's leading corrosion engineers. Our technicians are available to study your specific needs and to work with you toward achieving the protection required.

If your properties are being chewed up by corrosion or attacked by marine growth, fill out this attached coupon to obtain more information on Copon corrosion control for offshore equipment.

COAST PAINT & LACQUER CO., INC.
P. O. Box 1113, Houston 1, Texas

Please send me information about Copon's Corrosion Control for offshore equipment.

Name_____

Company_____

Position or Title_____

Address_____

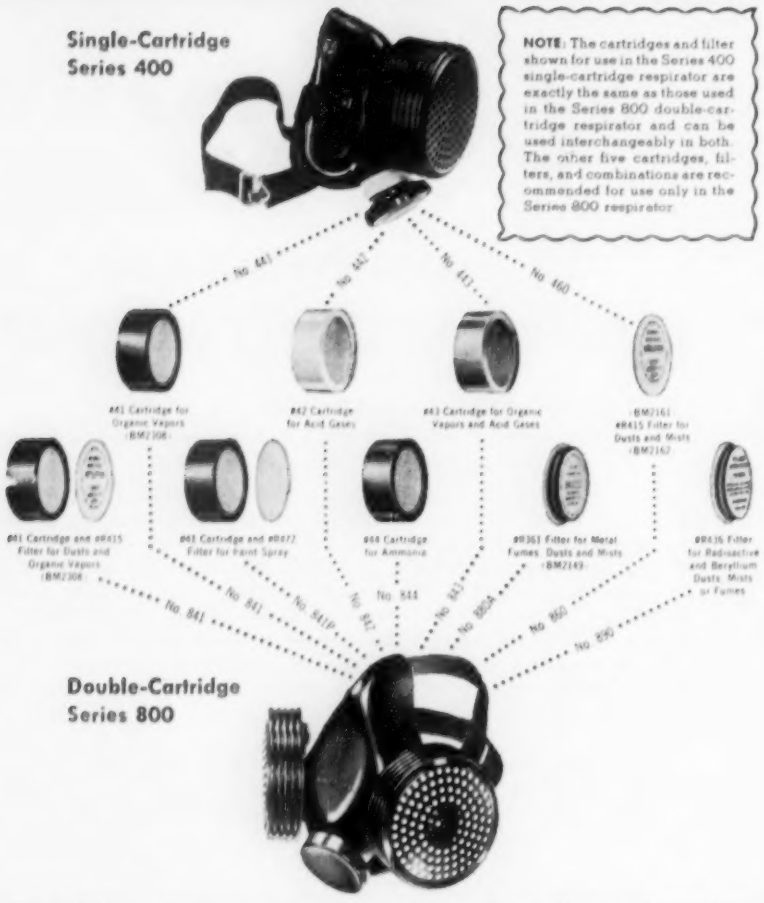
City_____ State_____

COAST Paint & Lacquer Co. Inc.

P. O. BOX 1113 • HOUSTON, TEXAS

NOW... WILLSON INTERCHANGEABLE RESPIRATORS

IN BOTH SINGLE AND DOUBLE CARTRIDGE STYLES!


Single-Cartridge
Series 400
NOTE: The cartridges and filter shown for use in the Series 400 single-cartridge respirator are exactly the same as those used in the Series 800 double-cartridge respirator and can be used interchangeably in both. The other five cartridges, filters, and combinations are recommended for use only in the Series 800 respirator.
No. 441
No. 442
No. 443
No. 460
#41 Cartridge for Organic Vapors (BM2168)
#42 Cartridge for Acid Gases
#43 Cartridge for Organic Vapors and Acid Gases
(BM2161) #8415 Filter for Dusts and Mists (BM2162)
#41 Cartridge and #8415 Filter for Dusts and Organic Vapors (BM2168)
#41 Cartridge and #8072 Filter for Paint Spray
#44 Cartridge for Ammonia
#8361 Filter for Metal Fumes, Dusts and Mists (BM2149)
#8435 Filter for Radioactive and Beryllium Dusts, Mists or Fumes
No. 841
No. 841P
No. 842
No. 844
No. 843
No. 8025
No. 860
No. 890
Double-Cartridge
Series 800

These Willson Respirators are the first truly interchangeable types in the field. Neither style requires additional parts or accessories to make use of the cartridges, filters, or combinations indicated to be used with them.

Write for bulletins describing these new Willson Interchangeable Respirators. Standardizing on them will give you the respiratory protection you want and simplify your inventory as well.

More than 300 Safety Products Carry This Famous Trademark

WILLSON®

Established 1870

WILLSON PRODUCTS, INC., 204 Washington Street, Reading, Pennsylvania

Springs in 26-9n-57e, had reached a depth of 7,135 ft.

New Map Published On State Of Nevada

The first published geologic map of Nevada is being released for general distribution by Brundidges, 136 North Sierra Street, Box 2455, Reno. The map was compiled by E. L. Stephenson, consulting geologist, formerly with the U.S. Geological Survey. It includes essentially all geologic information ever published on Nevada.

Successful Wildcats

SOUTHWEST TEXAS

Maverick County: Continental Oil Co. 1 Chittim, I&GN Sur., Block 6, Sec. 6. IP 103.12 BOPD, 3/32-in., 28.6°, Eagleford 3,109-39 ft. (open hole). TD 4,134 ft. (New field—18 miles east of Eagle Pass.)

TEXAS GULF COAST

Bee County: Head & Welsh and Chizum, Rhodes & Hicks 1 Murphy, James Byrne Sur., A-86. IP 10,000 M.c.f. daily, open-flow potential, 8 to 10 BC per M.M.c.f., perforations 4,657-62 ft. TD 6,697 ft. (New field.)

Hardin County: Michel T. Halbouty and George Graham 1-A Teel estate, T. C. Gaines Sur., A-23 (southwest flank of Saratoga dome). IP 135.52 BOPD, 11/64-in., 41.6°, perforations 5,246-48 ft. and 5,278-5,313 ft. TD 6,809 ft. (Extends West Saratoga field.)

Live Oak County: George H. Coates, Edwin M. Jones, and Kirkwood & Co. 1 Dunn, Refugio School Lands Sur., A-397. Shut-in gas well, no gage, perforations 8,078-88 ft. TD 9,245 ft. (New field.)

WEST CENTRAL TEXAS

Coleman County: H. A. Birdwell & Son 1 Weaver, Lesis Johnson Sur. 480, 8 mi. E Coleman. IPP 40 BOPD, 40°, GOR zero, Breneke sand 1,787-94 ft. TD 1,880 ft.

NORTH TEXAS

Baylor County: W. E. Butler 1 Motl, 25-1-D&W Sur., 4 mi. E Bomarton. IPP 39.5 BOPD, 35°, GOR 100, pay 1,533-71 ft. TD 1,571 ft.

Grayson County: Sinclair Oil & Gas Co. 1 Brown, Wm. Martin Sur., A-765, 4 mi. S Sherman. IPP 26 BOPD, 30.5°, GOR zero, Davis sand 8,018-62 ft. TD 9,676 ft.

WEST TEXAS

Runnels County: Thos. D. Humphrey & Sons 1 Spreen, R. M. Williamson Sur. 232, 6 mi. E Ballinger. IPP 35 BOPD, 44.6°, Morris 3,324-30 ft. TD 3,986 ft.

W. W. West 1 Fennell, 72-63-H. N. Baggs Sur., 4 mi. W Winters, dual completion. IP 199 BOPD, 16/64-in., 43.8°, CP 150 psi., GOR 489, Cisco limestone 2,964-74 ft.; IP 224 BOPD, 16/64-in., 43.8°, TP 210 psi., GOR 928, King sand 2,929-49 ft. TD 2,986 ft.

KENTUCKY

Christian County: Todd Moore et al 1 Peterson, SW SW SE 23-H-27. IPP 35 BOPD, 569-87 ft. TD 587 ft. (Opens Bull Creek pool.)

McLean County: Basin Drilling Co. 2 Yewell, NE NW NW 15-M-28. IPP 13 BOPD,

The BAASH ROSS "MULTIPLEX"

DOUBLE ROW TAPERED BEARINGS
maintain sheave alignment under both radial and thrust loads—give maximum resistance to sheave wobble, yet are close coupled and rugged.
ROLLED STEEL PLATES
carry all sheave loads—streamlined cast steel outer shell is completely load-free. Weight is concentrated low for steady block travel.
INTERNAL POCKETS
may be filled with lead to increase falling speed of Blocks, as desired.
ALL-IN-ONE CONNECTOR
Both the swivel and elevators are supported simultaneously without interference. Automatic hook lock cannot open under load, guides hook into position when open.
BAASH-ROSS

"MULTIPLEX" BLOCKS *are more compact*

than any other Block Assembly of comparable capacity

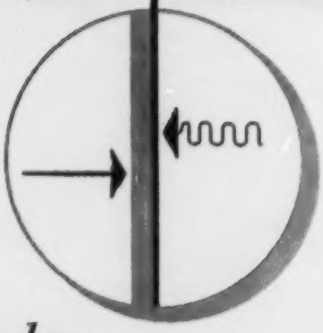
10 Sizes . . . 100 to 300 tons . . . 3, 4 or 5 sheaves.

BAASH-ROSS TOOL COMPANY
DIVISION OF JOY MANUFACTURING COMPANY

Los Angeles...Houston...Oklahoma City...Odessa...Casper...Canton, O....New York City

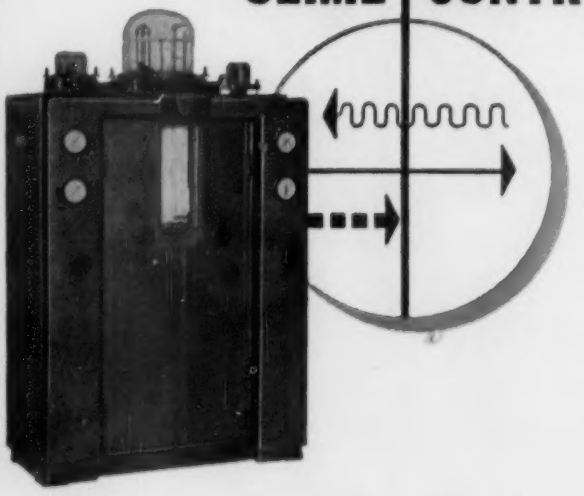
Where you need

HEAT | EXCHANGE



Be sure you have

SLIME | CONTROL



Whether you heat or cool water for make-up, process or any other use, you will need Wallace & Tiernan Chlorination to help combat slime problems introduced by waterborne bacteria or air-borne bacteria.

With slime control equipment designed for any need, built for lasting and dependable service, highly accurate and backed by over 40 years of successful application experience, Wallace & Tiernan Chlorination can help you increase the efficiency of your plant and cut operating costs. For further information write our Industrial Division.

WALLACE & TIERNAN

25 MAIN ST., BELLEVILLE 9, N. J.

CHLORINATORS • CHEMICAL FEEDERS • SCREENING EQUIPMENT • MAGNETIC SEPARATORS • PRECISION PRESSURE INSTRUMENTS • CATHODIC PROTECTION • FINE CHEMICALS

CD-30

Penn. sand 1,065½-80 ft. TD 1,080 ft. (Opens North Calhoun pool.)

SOUTH LOUISIANA

Jefferson Davis Parish: Lamson, Bennett & Cole 1 Rush, 25-7s-4w. IP 1,575 M.c.f. daily and 49 BCPD, $\frac{3}{4}$-in., 50° perforations 8,752-62 ft. TD 9,317 ft. (New pay in North China area.)

Pan American Production Co. 1-B Nickerson, 43-9s-5e. IP 203 BOPD, 11/64-in., 31.2°, perforations 11,506-14 ft., TD 13,705 ft. (Northwest flank of Anse La Butte dome—extension and new pay.)

Lafayette: Sunray-Mid Continent Oil Co. 1 States, 5-10s-3e. IP 1,570 M.c.f. daily and 19.38 BCPD, 7/64-in., 47°, perforations 10,739-45 ft. TD 11,110 ft. (New pay in Duson field.)

Pointe Coupee Parish: Sinclair Oil & Gas Co. 1 Gosserand et al, 11-5s-8e. IP 270 BOPD, $\frac{3}{4}$-in., 44.4°, perforatitons 10,396-10,418 ft. TD 10,495 ft. (New field.)

OKLAHOMA

Hughes County: J. W. Gallagher-Wolfe Drilling Co. 1 Smith, NE NE SE 28-8n-9e. IPP 48 BOPD, Hartshorne sand 2,898½-2,906 ft., 37°. TD 3,162 ft. (Oil discovery.)

KANSAS

Barber County: Brooks-Hall 1 Grigsby, SE SW SW 15-30s-13w. IPP 11 BOPD, Arbuckle 4,636-42 ft., 4,647-58 ft., 34°. TD 4,658 ft. (Opens North Skinner pool.)

Graham County: Century Refining Co.-K&F Drilling Co. 1 Ferrell, SE SE NW 32-9s-22w. IPP 122 BOPD, Lansing lime 3,776-79 ft. TD 4,040 ft. (Opens Red Line pool.)

Kingman County: Pickrell Drilling Co. 1 Holcomb "A," SW SW SW 26-30s-19w. IP 1,500 M.c.f. of gas per day, Mississippian 4,350-70 ft. TD 4,420 ft. (Gas discovery.)

Sumner County: South Texas Development Co. 1 Kerschen, SW NW NW 17-31s-3w. IPP 79 BOPD, Kansas City lime 3,320-28 ft., 36°. TD 3,328 ft. (Opens Kerschen pool.)

NEBRASKA

Kimball County: Sure Oil Co. 1 Hoskovec, C SE SE 31-14n-57w. IPP 211 BOPD, "J" sand discovery, new field. TD 7,136 ft. "J" sand.

CALIFORNIA

Ventura County: Shell Oil Co. 2 S.P.S., NE SW 29-3n-21w. IPF 212 BOPD, 31.5° gravity, 12/64-in. choke, perfs. 7,425-7,640 ft., TD 12,020, redrilled TD 8,284 ft. (New field discovery 2 miles southwest of West Mountain field; formation tests indicate two shallower pays.)

COLORADO

Adams County, Cabin Creek: Superior Oil Co. 11-16 Hartman-State, NW NW NW 16-3s-59w. IPP 7 BOPD, "J" sand discovery, new field. TD 6,248 ft. "J" sand.

Baca County, South Greenwood: Moran Bros. 1 Holt, NE NE NE 21-34s-41w. IP 3,075 M.c.f. of gas per day, Topeka-Penn discovery, new field. TD 3,148 ft. Lansing. Located in Anadarko basin area of extreme southeastern Colorado.

Logan County, Winston: Calvert-Zoch & Campbell 1 Roper, C SW NE 6-10n-52w. IPP 240 BOPD, "J" sand discovery, new field. TD 5,320 ft. Skull Creek.

Washington County, Surveyor Creek: Al Ward & Son-Denver Basin 1 Schmidke, C SW SE 21-2n-52w. IP 3,600 M.c.f. of gas per day, "D" sand discovery, new field. TD 4,713 ft. "J" sand.

ALBERTA

Shell A7-31 Carbon, LSD 7, 31-29-22w4. Glauconitic gas well. TD 6,548 ft.

Algeria
Angola
Aden
Alaska
Australia
Africa
Aruba
Brazil
Bahrein
Burma
Belgium
Ceylon
Canary Islands
Channel Islands
Cuba
Canada
Canal Zone
Columbia
Chile
Curacao
Cyprus
Denmark
Egypt
England & Wales
Gold Coast
Germany
Hawaiian Islands
India
Indonesia
Iraq
Italy
Iceland
Ireland
Japan
Labrador
Mozambique
Malaya
Mexico
Nigeria
Netherlands
New Zealand
North Rhodesia
Peru
Philippine Islands
Puerto Rico
Qatar
South Africa
South Rhodesia
Saudi Arabia
Syria
Sumatra
Scotland
Trinidad
Trieste
Uruguay
Venezuela
West Indies

Confidence cannot be bought over the counter. It must be earned through years of satisfactory experience. Confidence dearly earned is a manufacturer's most valuable asset. Confidence is the basis upon which the major oil producers buy equipment to ship to far away places. Throughout the world, where oil is produced, refined, stored or transported—there you will find S&J vapor conservation, tank safety, and automatic gaging equipment.

The equipment for use in the Sterling Areas is made in England by Whessoe, Ltd. That for use in the Dollar Areas is made in the United States by Shand & Jurs Co. Whether you BUY BRITISH -or BUY AMERICAN, you get identical equipment, made from the same drawings—to the same specifications. Whether you deal in Pounds or Dollars, whether you figure in inches or centimeters—CONFIDENCE means the same thing in every language—any place on earth. That's why, where there's oil, there's S&J.

Shand and Jurs Co.
BERKELEY 10, CALIFORNIA

NEW YORK
342 Madison Ave.

HOUSTON
M & M Bldg.

TULSA
Thompson Bldg.

CHICAGO
10409 S. Western Ave.

LOS ANGELES
714 W. Olympic Blvd.

REPRESENTATIVES:
SEATTLE: Nebar Supply Company, 3000 Western Avenue
MONTREAL: Lytle Engineering Specialties, Ltd., 360 Notre Dame St. W.
TORONTO: Lytle Engineering Specialties, Ltd., 69 Eglington East
VANCOUVER: P. D. McLaren & Son, Ltd., 3277 Main Street
CARACAS: Sinclair Spence, C.A., Edificio Galipan
ENGLAND: Whessoe, Ltd., Sales: 25 Victoria St., London S. W. 1
Whessoe, Ltd., Works: Darlington, County Durham

YOU'VE GOT TO KNOW WHERE...

McCullough's MAGNA-TECTOR® (Free Point Finder) tells you exactly where to make the "big catch"

Accurately determines the lowest free point in stuck pipe by measuring stretch, compression and torque – enables speedy, efficient back-off with maximum free pipe recovery – the "biggest catch" possible.

Over 10,000 successful jobs in drill pipe, tubing and casing is proof that the McCULLOUGH MAGNA-TECTOR® gets the results you want – greatest free pipe recovery ... in less rig time ... at lower cost.

Ask about our new ONE-TRIP Back-off Service – available in an increasing number of service areas. Write for Bulletins 401 and 402.

Two Careers in One

Texas Eastern executive is engineer and attorney

FEW executives in the petroleum industry have a combination of education and experience to match that of John C. Jacobs, Jr., of Dallas.

The recently elected vice president of Texas Eastern Transmission Corp. is both a chemical engineer and a lawyer. He has had notable success weaving the two careers into one.

Jacobs' potential as an executive was recognized early by Harry W. Bass, well-known Dallas drilling contractor and independent oil operator. Two years ago Bass named this lawyer-engineer, then only 35, executive vice president and a director of Wilcox Trend Gathering System, Inc.

Texas Eastern noticed Jacobs' abilities after it bought a majority interest in Wilcox and agreed to hook up with the new supply line.

Diversified talent . . . Since he took his first industry job 16 years ago, Jacobs has demonstrated talent in process design, construction, operation, and control in a refinery; at reservoir engineering; at design, construction, and operation of natural-gasoline and cycling plants; at unitization of production and the planning and carrying out of pressure-maintenance and secondary-recovery programs; at pipelining and marketing gas; and as an authority in oil and gas law.

He started out in an oil atmosphere—born at Guymon, Okla., in the Panhandle, and reared at Lone Wolf, Okla. After high school he attended Oklahoma Military Academy at Claremore from 1932-36. With the equivalent of a junior-college education, he entered Georgia School of Technology at Atlanta and graduated in 1939 with a B.S. degree in chemical engineering.

He took his first oil job that year as a process engineer with Standard Oil Co. of Louisiana at its (now Esso Standard's) Baton Rouge refinery.

He spent 5 years there—first in process control of cracking, lube, light ends, and distillation plants; later in construction and operation of aviation-gasoline facilities; and finally in the construction and startup of the Baton Rouge butyl-rubber plants. During the first 2 years of this stretch, he broadened his engineering education with advanced courses at Louisiana State University.

Venezuelan hitch . . . In the early forties, the war caused a heavy drain on technical personnel in the oil industry. Creole Petroleum Corp., big Latin American affiliate of Standard Oil Co. (N. J.), was among the companies scouting the field for new technical talent. Company officials combed Jersey and affiliated organizations in this country, and one of the men they came up with was Jacobs. He had lost his reserve commission in the Army because of a perforated ear drum, and he wasn't acceptable to Uncle Sam for military service because of this and his defense-essential job classification.

Jacobs went to Venezuela as a reservoir engineer and soon was placed in charge of Creole's gas-conservation operations. In 1945 and 1946, he coordinated the design and construction of gas-processing plants at Jusepin and Mulata in eastern Venezuela. He also made economic studies and designed Creole's gasoline plant at Cumarebo in the Falcon area of western Venezuela.

Jacobs' wife, Elinor, became ill in 1946, and he resigned his job with Creole to return to the United States. It was then he decided to attend law school at Yale University.

Twin careers . . . He was awarded his L.L.B. degree in only 2 years and went to Dallas in 1948 to join Nebo Oil Co. His work with Nebo was an odd mixture of law and engineering.

Jacobs left Nebo in 1951 to open his own law offices in Dallas, after 2 years of night-school study of advanced oil and gas law. Here too he spent about as much time in engineering work as at actual law practice. He left his law practice to join the Bass firm.

Jacobs remains active in both his professions. He is registered as a professional engineer in Texas and in Venezuela and is a member of various technical societies. He is almost equally active in state and national bar associations, and he teaches a course to graduate law students at Southern Methodist University on governmental regulation of the oil and gas industries.

He likes golf and horseback riding. He also spends many hours over good books, especially those dealing with the history of western civilization.

Frank J. Smith, manager of the petrochemical division of American Oil Co., has been elected vice president and general sales manager, a director, and member of the executive committee of the newly formed subsidiary, Pan American Chemicals Corp. Smith joined the company as assistant director of research at American Oil Co.'s Texas City, Tex., refinery in 1942. He went to New York in 1947 as head of the chemicals division.

J. M. Scranton, production engineer with Richfield Oil Corp. at New Cuyama, Calif., has been promoted to reservoir engineer and transferred to Los Angeles.

T. C. Storer, senior petroleum engineer for Stanolind Oil & Gas Co., Houston, has been named district engineer for the Corpus Christi, Tex., district, replacing **F. H. Allen,** recently promoted to division engineer of Stanolind's central division. Storer was previously field engineer for the company at Luby and Hastings, Tex.

Paul L. Lyons, former manager of exploration and production for Anchor Petroleum Co., has resigned to join Sinclair Oil & Gas Co. as chief geophysicist. He began his petroleum career with Humble Oil & Refining Co. in 1934 and was transferred to Carter Oil Co. in 1935. He remained with Carter until he joined Anchor in 1952. Lyons is president of the Society of Exploration Geophysicists.

John R. Ellis has resigned from Jenkins & Hand to enter business as a consultant for the oil, gas, and uranium industries. Before joining Jenkins &

Hand, he served 5 years with Carter Oil Co. in Montana, Oklahoma, and Wyoming.

Fred D. Spindle, geologist with Ohio Oil Co., has been transferred from Houston to Casper, Wyo.

Robert G. Bushnell has been elected a vice president and treasurer of Buckeye Pipe Line Co.

Don Becker, geologist with Gulf States Oil Co., at Billings, Mont., has resigned to join Colorado Oil & Gas Co., Denver.

Clinton Lueth has resigned as chief geologist with American Republics Corp. at Houston, to form Lueth & Robishaw at Houston. The new firm will conduct independent oil operations.

Earl D. Wallace has been elected a director and member of the executive committee of Middle States Petroleum Corp. Wallace, now a consultant on oil and gas matters to Dillon, Read & Co., Inc., was formerly president of Sohio Petroleum Co. and a vice president and director of Standard Oil Co. of Ohio.

R. W. Dye has been elected a vice president of Oceanic Oil Co. Dye, who has been with Oceanic since 1953, previously was with Standard Oil Co. of California.

Carman M. Ferree, geophysical supervisor for Continental Oil Co. at Casper, Wyo., has been promoted to division geophysicist. He succeeds **Charles B. Smith,** who was transferred recently to the company's office in Denver. Ferree has been with Conoco since 1948.

J. M. Clark, vice president of Clark-Dale Drilling Co., Midland, Tex., has resigned to become vice president of exploration and production for Pacific Northwest Pipe Line Corp. at Albuquerque, N. M. **W. R. Johnston,** supervising petroleum engineer for Humble Oil & Refining Co.'s West Texas division at Midland, also has resigned to join Pacific Northwest. He will be manager of production operations and assistant to Clark. Before joining Clark-Dale in 1951, Clark was an executive with the Chicago Corp. at Corpus Christi, Tex.

Eastern District A.P.I. Members Cited for Work

Four members of the eastern district of the division of production of the American Petroleum Institute were honored recently at a banquet in Pittsburgh. The citations were awarded for outstanding service in various capacities over a period of years. A. W. Thompson, Houston, A.P.I. vice president for production, made the awards. Members who received the awards are, left to right, R. B. Anderson, Columbian Carbon Co., Charleston, W. Va.; John T. Galey, independent producer, Pittsburgh; Thompson; Robert L. Tope, Tope Oil Co., Mount Pleasant, Mich.; and Sam S. Taylor, U.S. Bureau of Mines, Morgantown, W. Va.

J. W. Ferguson, assistant manager of Continental Oil Co.'s coordinating and planning department, has been promoted to acting manager. He joined Continental in 1952.

John Fledderjohn has been appointed staff engineer of the home office operations department of the marketing department of General Petroleum Co. He had been serving as construction superintendent at General Petroleum's Vernon, Calif., office.

William E. Walkup has been elected to the board of directors of Signal Oil & Gas Co. Walkup joined Signal in 1939 and has worked in various engineering posts. During the past few years, he has served as administrative assistant to the president.

W. E. EADIE

William E. Eadie, former assistant managing director of Burmah Oil Co., Ltd., has been promoted to managing director. A native of Glasgow, Scotland, Eadie has served with Burmah 34 years. He has been stationed in Burma, Calcutta, and London. He replaces **W. E. V. Abraham,** who retired from the managing directorship at his own request. Abraham remains as a director.

Howard D. Barnes, geologist with Shell Oil Co., has been transferred from Durango, Colo., to Elma, Wash.

E. W. Rickey has resigned as engineer with Pioneer Corp. at Chanute, Kans., to join **F. Kirk Johnson** as a water-flood engineer at Bartlesville, Okla.

Alfred D. Brown has joined Pubco Development, Inc., as district engineer at Aztec, N. M. He had been serving as a petroleum engineer with Gulf Oil Corp. at Crane, Tex.

Sterling P. Blumberg has been promoted to senior research engineer in the research and development division at the Baytown, Tex., refinery of Humble Oil & Refining Co. He has been with Humble since 1943.

John J. Waybright has been elected a director of International Petroleum Co., Ltd., to fill the board vacancy created by the retirement of **L. P. Maier.** It was reported erroneously earlier that Waybright succeeded Maier as chairman of the board.

G. Elmore Mays, assistant chief engineer of Interstate Oil Pipe Line Co., has been appointed administrative assistant to **J. J. Winterbottom,** transportation coordinator, and **Loren K. Kahle,** deputy transportation coordinator, of Standard Oil Co. (N. J.). Mays joined Carter in 1938.

PERSONALS

W. W. Henry, geologist for Union Oil Co. of California, has been elected president of the Corpus Christi Geological Society.

Jesse M. Carr has joined Esso Laboratories at Baton Rouge, La. Carr is a chemical engineer with B.S. and M.S. degrees from Virginia Polytechnic Institute.

Byron Rife, former vice president and director of Holly Development Co., has been named president and general manager of Hillcrest Oil Co. with headquarters at San Antonio.

Henry Carter Rea, veteran Rocky Mountain Petroleum consultant, has moved his offices from Casper, Wyo., to Denver. Rea had been in Casper for 9 years.

Richard L. Porter, former district geologist of the Houston office of Sinclair Oil & Gas Co., has been named district landman in the newly created Beaumont district of Sinclair. **Leo M. Wright** has been promoted to district geologist at Houston to succeed Porter.

Dr. W. C. Howells has been promoted to vice president and manager of the producing department (Canada) of McColl-Frontenac Co., Ltd. Howells, who had been serving as general manager of the department since January 1, 1954, will be headquartered at Calgary.

C. C. Combs has been elected a vice president of Shell Pipe Line Corp. Combs joined Shell in 1923 as a service station attendant in California. He was named an auditor in 1927 and since then has risen through positions of resposibility in Los Angeles, San Francisco, Honolulu, and the Martinez, Calif., refinery. Since 1950 he has been on various special assignments.

A. O. Settar has been named joint interest coordinator of the production department at Caracas, Venezuela, by Creole Petroleum Corp. Other changes made by Creole in Venezuela are **J. L. Worthington,** named coordinator of fuels and lubricants in the production department; **Malcolm G. Baker,** named supervisor of the interpretation activities of the geophysics section of the geological department; **G. Betancourt,** named labor relations supervisor at Amuay; and **Robert Blayney**, appointed acting supervisor of the industrial relations group in the Lagunillas district.

Harry McLeod has been named superintendent of the crude-oil pipeline division of Arkansas Fuel Oil Corp. McLeod has served as assistant superintendent of crude-oil pipelines since January 1, 1951. He has been with the company since 1929.

Quin Hayes, party chief for Mobil Producing Co. at Dickinson, N. D., has been promoted to district geophysicist and transferred to Bismarck, N. D.

John M. Crawford, Continental Oil Co., has been elected president of the Geophysical Society of Tulsa for the 1955-56 year. Other officers elected are **Stanley W. Wilcox,** Seismograph Service Corp., first vice president; **William M. Erdahl,** Skelly Oil Co., second vice president; **Robert B. Rice,** Phillips Petroleum Co., treasurer; and **John J. Rupnik,** Manhart, Millison & Beebe, secretary. **Paul L. Lyons,** Sinclair Oil & Gas Co., and **Dr. L. Y. Faust,** Amerada Petroleum Corp., were named district representatives to the Society of Exploration Geophysicists.

J. T. Simon has been promoted to vice president of Mountain Fuel Supply Co., Rock Springs, Wyo. Simon began his career with Ohio Oil Co. after he was graduated from the University of Tulsa in 1939. He joined Mountain Fuel in 1943 as petroleum engineer and in 1945 he became chief engineer. He was promoted to assistant manager of the producing division in 1954.

Oswald Newell, Jr., senior process engineer in Continental Oil Co.'s manufacturing department at Houston, has been named to receive the 1955-56 Sloan Fellowship at the Massachusetts Institute of Technology, Cambridge, Mass. Established by Alfred Sloan Foundation, Inc., the fellowship program was founded in 1938 to train young technical executives for future positions of business leadership. The course runs from June 1955 to June 1956. Newell joined Conoco at Ponca City, Okla., in 1948. He was promoted to process engineer in 1951 and was named senior process engineer in 1952.

DEATHS

Bert G. Goble 83, Tulsa oil man, died recently at his home there. Goble was best known for his discovery of the El Dorado pool in Kansas and for the Stonebluff pool in Wagoner County, Oklahoma. The discovery of the El Dorado pool came in 1913 when there were no wells within 75 miles of the town. The field eventually produced 200 million barrels of oil.

D. Dale Condit, 69, consulting geologist, died recently at his home in Stamford, Conn. He had been retired from Standard-Vacuum Oil Co. since 1950. He had worked in England, Australia, India, Central America, Dominican Republic, Mozambique, Turkey, and Pakistan.

Edward J. Bonacker, 92, pioneer Tulsan and oil producer, died recently in a Tulsa hospital. He was one of the first producers in the Glenn Pool oil field and was former owner of Bonacker Oil & Gas Co., Tulsa.

Lot (Jerry) Bowen, 57, manager of employe relations for Western Gulf Oil Co., died in Los Angeles recently of a heart ailment. Bowen had been with Western Gulf for more than 30 years, serving as superintendent of production from 1941 to 1949.

Jack E. Bliss, 44, joint owner of Rotary Engineers, Midland, Tex., well-logging company, died in Dallas recently. Bliss worked for Amerada Petroleum Corp. after graduating from the University of Colorado in 1934. He resigned to join Baroid Division of National Lead Co. in 1938 as a research engineer. He resigned in 1943 to join with Olin Prather, Midland, to form Rotary Engineers.

Roy D. Roberts, 62, retired official of Sun Oil Co., died recently at his home in Tulsa. Roberts was production superintendent at Beeville, Tex., when he retired in 1943.

Guy D. Harper, holder of several patents in the development of anti-knock gasoline, died recently at Franklin, Pa.

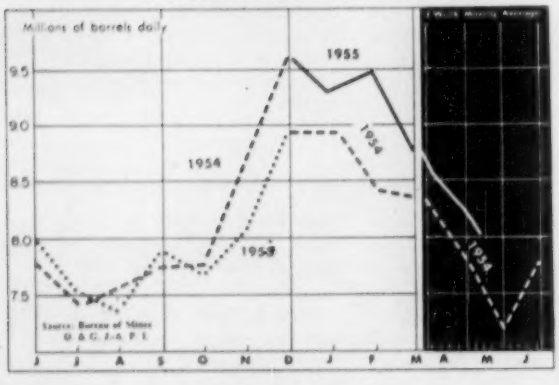
Leo Patrick Kellar, 58, Newcastle, Wyo., independent oil operator, died recently at his home in Newcastle after suffering a heart attack.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,696,875	DOWN	9,850	UP	235,275
Crude stocks	276,314,000	UP	1,338,000	UP	3,311,000
Completions	1,617	UP	84	UP	105
Refinery runs	7,061,000	UP	32,000	UP	41,000
Gasoline stocks	171,134,000	DOWN	3,109,000	DOWN	4,616,000
Distillate stocks	72,710,000	UP	2,159,000	UP	7,179,000
Four-product stocks	310,956,000	UP	662,000	UP	3,089,000
Total imports	916,600	DOWN	235,100	UP	71,300

TOTAL DEMAND—ALL OILS



Figures on Production of L.P.G. and Natural Gasoline May Become Distorted

NATURAL-GASOLINE-PLANT operators and refiners are going to have a tough bookkeeping job in the years ahead if they are to report accurate production totals for L.P.G. and natural gasoline. It may seem strange for refiners to get in on the problem of correct reports for natural-gas-liquids production. Here's how the refiner comes into the picture.

Total plant production of natural-gas liquids in 1954 amounted to 248,137,000 bbl. Out of this total, 153,915,000 bbl. was delivered from plants and terminals for use in gasoline. Refiners reported using 117,549,000 bbl. for blending. The remainder was blended outside refineries or exported.

In a breakdown of the total, refiners reported that they received and used 29,278,000 bbl. of L.P.G. They also received and used 96,397,000 bbl. of natural gasoline, ranging from below 12 lb. to over 36 lb. vapor pressure. Isopentane and miscellaneous products made up the remainder.

The natural with pressure below 12 lb. accounted for only 18,528,000 bbl. All the remaining natural contained some L.P.G. Almost 14,000,000 bbl. of this natural had vapor pressure above 36 lb.

As long as plant products were kept separated during shipment and while in storage at refineries, there was no confusion about which products at a refinery came from crude and which from natural-gas liquids.

However, the high cost of rail transportation has shifted a large portion of the plant-to-refinery movement to crude lines. Most natural-gasoline plants are located near crude lines. Since the addition of light products to the crude stream raises the gravity of the crude and increases the capacity of the line, the light products almost "get a free ride" to the refinery.

The high-pressure gasoline which is commingled with crude when received by the refiner loses its L.P.G. in the first refinery processing. In the refinery records of production, it may be difficult to separate final products according to origin.

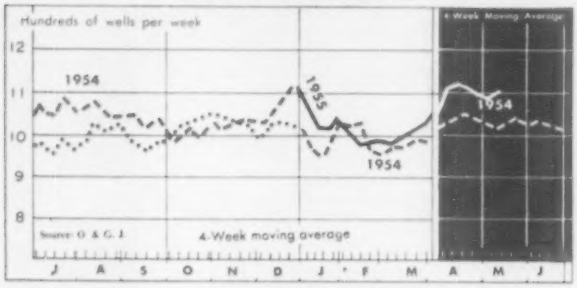
Material first reported as natural may end up as L.R.G., and some L.P.G. may be reported twice, once as L.P.G. and again as L.R.G. Total demand data will not be affected by the errors. The mixup will prevent proper production credit and may cause an understatement of gasoline yields from crude.

Recent developments in cat reforming will promote greater use of natural-gas liquids in motor fuel. Since only the heavy ends of natural will be reformed, the close fractionation required may place the units at refineries rather than at natural-gasoline plants.

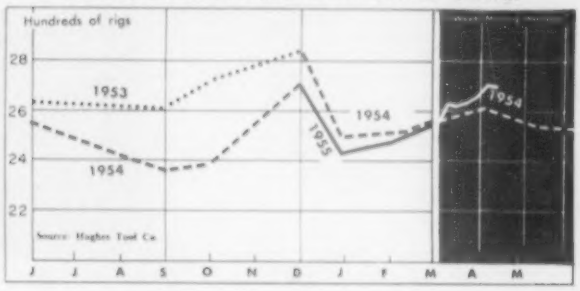
More of the future plants may be extraction units only, with the entire liquid stream piped to some refining center. No L.P.G. as such would be produced at plants. Products from gas liquids will be so thoroughly mixed with products from crude that origin credits may not be available from refinery records.

Plant production may be based on analysis of the liquid stream rather than finished product totals.

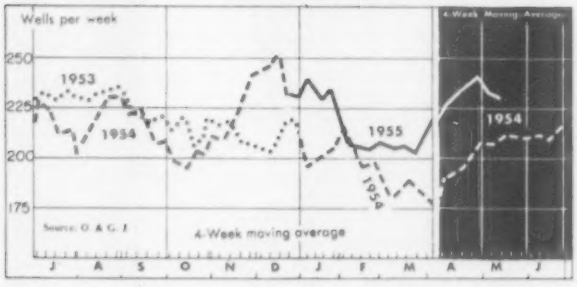
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS*

Area—	5-16-55	Change from 5-9-55	Change from 5-17-54
Gulf Coast	586	15	23
N. and W. Texas-New Mexico	908	21	141
Arkansas-N. Louisiana-E. Texas	166	2	—3
Oklahoma	329	—18	14
Kansas-S. Nebraska	186	—9	22
Illinois-Eastern	148	—25	6
Rocky Mountain	231	10	—21
Pacific Coast	143	—4	—3
Total United States	2,697	—8	179
Western Canada	88	11	—24

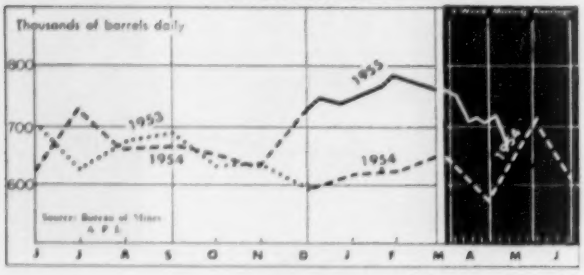
*Hughes Tool Co.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED MAY 14, 1955

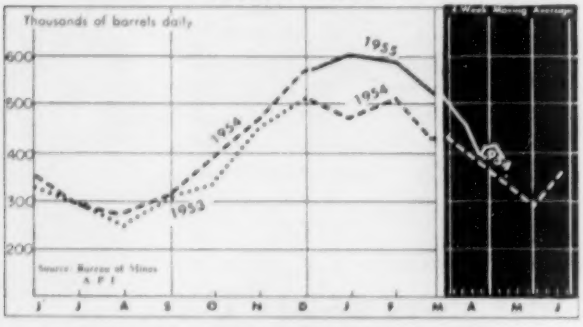
	Total of all wells: Comp.	Oil	Gas	Dry	Footage	Cum. 1955	Cum. 1954	Wildcat completions and discoveries: Oil	Dist.	Gas	Dry	Total	Cumulative total, 1955: Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	0	0	0	0	0	37	41	0	0	0	0	0	0	0	0	35	35
Arkansas	9	7	0	2	32,047	241	224	0	0	0	0	0	13	0	0	62	75
California	63	43	0	20	333,649	955	921	1	0	0	14	15	14	0	3	138	155
Colorado	32	8	4	20	174,465	492	466	2	0	2	13	17	18	0	12	246	276
Illinois	69	37	0	32	158,376	1,295	987	2	0	0	14	16	25	0	1	202	228
Indiana	12	2	0	10	18,734	264	306	0	0	0	1	1	7	0	0	117	124
Kansas	110	63	6	41	406,997	1,848	1,608	3	0	1	10	14	46	1	14	277	338
Kentucky	23	7	4	12	33,996	445	395	2	0	0	3	5	14	0	5	69	88
Louisiana	71	45	5	21	458,268	1,361	1,140	2	2	0	11	15	42	33	10	133	218
North	30	21	3	6	82,256	701	594	0	0	0	4	4	7	3	1	53	64
South	41	24	2	15	376,012	660	546	2	2	0	7	11	35	30	9	80	154
Michigan	7	4	0	3	14,002	185	201	0	0	0	1	1	5	0	0	71	76
Mississippi	12	6	1	5	99,651	178	135	0	0	0	2	2	4	0	0	61	65
Montana	13	5	0	8	38,759	116	99	0	0	0	2	2	2	0	1	33	36
Nebraska	25	5	0	20	152,963	230	121	2	0	0	14	16	16	0	0	92	108
New Mexico	41	18	18	5	162,267	510	406	0	0	0	1	1	15	1	3	37	56
Northwest	18	0	17	1	69,850	138	125	0	0	0	0	0	1	0	3	11	15
Southeast	23	18	1	4	92,417	372	281	0	0	0	1	1	14	1	0	26	41
North Dakota	3	3	0	0	25,794	78	84	0	0	0	0	0	0	0	0	12	12
Ohio	26	12	5	†9	51,276	389	417	0	0	0	1	1	1	0	2	10	13
Oklahoma	148	95	7	‡46	492,314	3,129	3,345	2	0	0	11	13	51	7	14	231	303
Pennsylvania-New York	*108	57	10	§41	155,520	624	895	0	0	0	0	0	0	0	5	3	8
Texas	367	216	11	140	1,627,744	7,092	6,568	7	0	3	82	92	270	40	48	1,490	1,848
Southwest (1 & 4)	47	28	1	18	208,054	1,125	920	1	0	0	14	15	38	10	16	287	351
Gulf Coast (2 & 3)	41	18	4	19	261,012	936	958	1	0	3	7	11	33	25	19	232	309
East (5 & 6)	21	10	2	9	96,917	354	333	0	0	0	5	5	11	2	1	113	127
North Central (7-B & 9)	143	80	0	63	455,012	2,511	2,516	3	0	0	32	35	132	0	2	580	714
West (7-C & 8)	98	67	1	30	551,169	1,803	1,508	2	0	0	23	25	53	1	6	270	330
Panhandle (10)	17	13	3	1	55,580	363	333	0	0	0	1	1	3	2	4	8	17
Utah	1	0	0	1	6,614	26	22	0	0	0	1	1	2	0	2	15	19
West Virginia	12	1	8	3	35,085	215	197	0	0	0	1	1	0	0	3	9	12
Wyoming	15	5	0	10	50,493	286	531	0	0	0	7	7	6	0	3	56	65
Miscellaneous	0	0	0	0	0	15	76	0	0	0	0	0	0	0	0	13	13
Total United States	**1,167**	639	79	449	4,529,014	20,011	19,185	23	2	6	189	**220**	551	82	126	3,412	4,171
Total previous week	1,083	640	55	388	4,086,691			26	3	3	175	207	528	80	120	3,223	3,951
Total May 15, 1954	1,062	613	44	405	4,250,692			23	1	4	181	209	495	51	121	3,192	3,859
Western Canada	21	10	2	9	102,052												

*New York figure incl. winter backlog. Service wells included: †1, ‡6, §39.

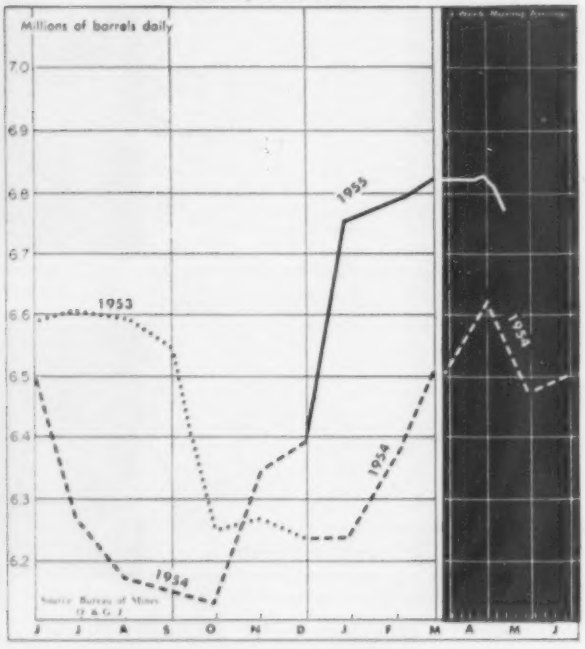
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE OIL PRODUCTION

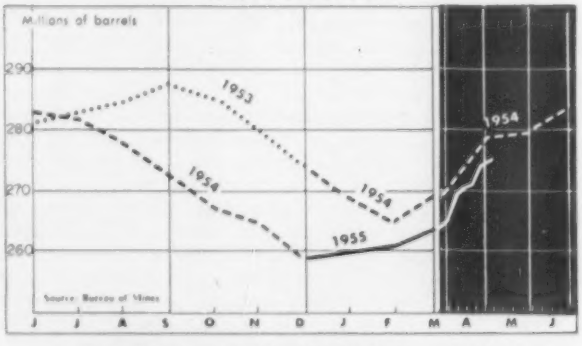


DAILY AVERAGE PRODUCTION FOR WEEK

	May 14 Crude oil	May 14 Lease condensate	May 14 Total	May 7 total
Alabama	4,000		4,000	4,300
Arkansas	75,400	500	75,900	75,300
California	977,600		977,600	976,800
Colorado	140,500		140,500	140,800
Eastern	46,500		46,500	46,500
Florida	1,350		1,350	1,350
Illinois	222,200		222,200	221,900
Indiana	27,800		27,800	28,400
Kansas	310,600		310,600	327,300
Kentucky	39,300		39,300	39,100
Louisiana	676,100	53,100	729,200	728,550
North	112,100	3,100	115,200	114,550
South	564,000	50,000	614,000	614,000
Michigan	32,100		32,100	32,200
Mississippi	91,975	4,700	96,675	96,675
Montana	44,800		44,800	44,100
Nebraska	29,500		29,500	29,400
New Mexico	227,600	4,150	231,750	231,750
North Dakota	26,900		26,900	28,100
Oklahoma	555,900		555,900	550,400
Texas	2,761,000	50,300	2,811,300	2,811,300
Dist. 1	53,600	600	54,200	54,200
Dist. 2	139,700	8,200	147,900	147,900
Dist. 3	427,000	22,800	449,800	449,800
Dist. 4	232,500	5,475	237,975	237,975
Dist. 5	45,500	475	45,975	45,975
Dist. 6	118,000	5,450	123,450	123,450
East Texas field	213,000		213,000	213,000
Dist. 7-B	139,000	50	139,050	139,050
Dist. 7-C	185,400	4,350	189,750	189,750
Dist. 8	912,800	2,000	914,800	914,800
Dist. 9	207,000	775	207,775	207,775
Dist. 10	87,500	125	87,625	87,625
Utah	6,200		6,200	6,300
Wyoming	286,400		286,400	285,900
Others	‡400		‡400	300
Total U. S.	6,584,125	112,750	**6,696,875**	6,706,725
Change from prev. week, down			**9,850**	
Canada	†305,600		†305,600	†203,150
Total U.S. production January 1-May 14			905,567,375 bbl.	
Same period last year (crude plus cond.)			*862,669,560 bbl.	

*Includes 13,903,675 bbl. condensate. †Week ended previous Monday. ‡S.D. 100. Nev. 300.

CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

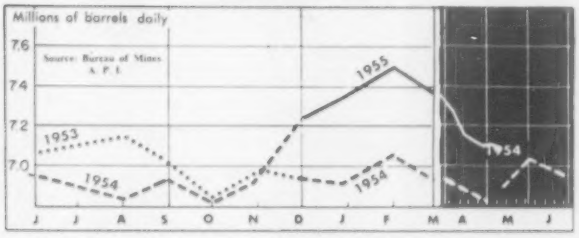
(Thousands of barrels)

	May 7, '55	Apr. 30, '55	May 8, '54
Pennsylvania Grade	2,876	2,812	3,030
Other Appalachian	1,945	2,011	1,989
Illinois, Indiana, Michigan	11,827	11,591	12,302
Nebraska, North Dakota	2,170	2,375	(‡)
Kansas	8,849	8,416	9,625
Oklahoma	24,907	25,171	27,466
Arkansas	2,841	2,914	3,204
Louisiana	15,740	15,450	16,238
North	2,693	2,482	2,479
South	13,047	12,968	13,759
Mississippi	2,760	2,869	3,314
New Mexico	8,743	8,901	7,192
Texas	128,823	127,569	125,709
East Texas proper	10,569	10,597	11,672
West Texas	54,974	56,227	54,677
Texas Gulf	26,115	25,179	26,676
Other Texas	37,165	35,566	32,684
Wyoming	15,479	15,351	13,978
Other Rocky Mountain	5,261	5,467	3,854
California	32,035	32,268	33,789
Foreign	†12,058	11,811	11,313
Total	276,314	274,976	273,003

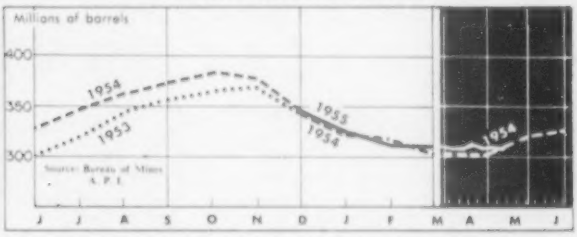
*Bureau of Mines. †Includes 2,425,000 bbl. in California. ‡Included with Kansas.

CURRENT DATA ON RUNS AND PRODUCTION ARE 4-WEEK AVERAGES

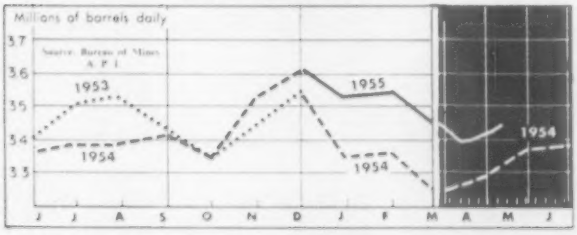
REFINERY RUNS



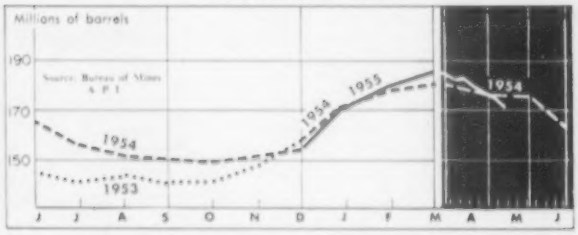
FOUR-PRODUCT STOCKS



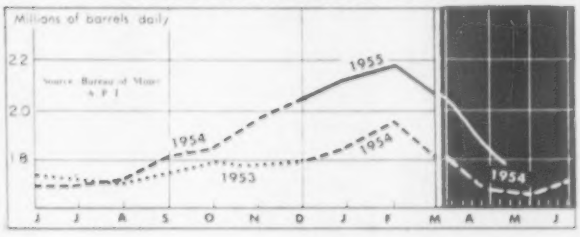
GASOLINE PRODUCTION



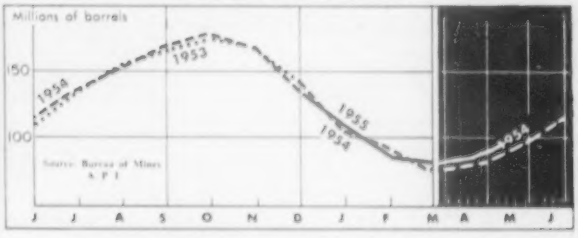
GASOLINE STOCKS



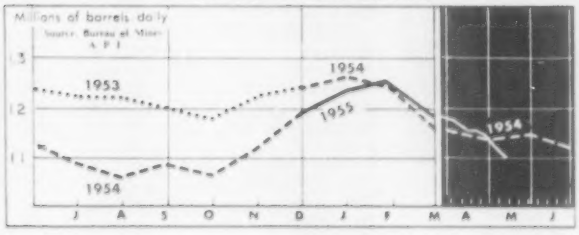
MIDDLE-DISTILLATE PRODUCTION



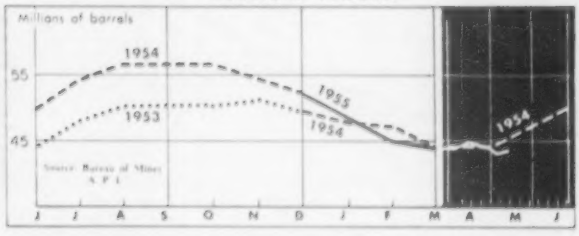
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



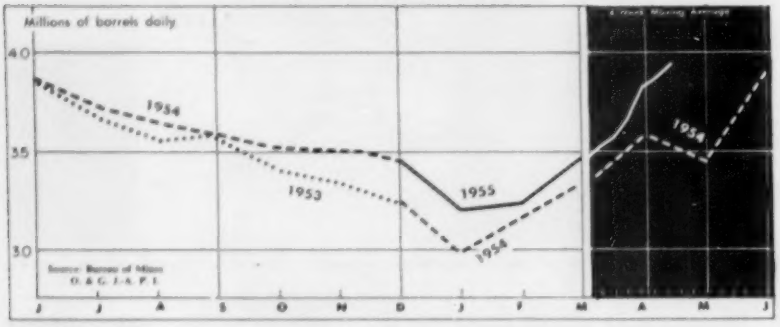
A.P.I. REFINERY REPORT, MAY 13

(Thousands of barrels)

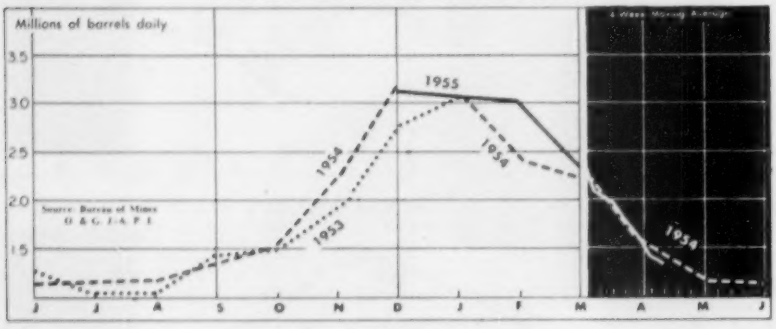
District—	Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.	Stocks‡: Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, May 1954: Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.
East Coast	878	345.3	28.6	223.7	170.6	35,781	9,304	24,236	8,691	1,038	412.8	28.9	216.9	206.7
Appalachian:														
District 1	92	40.4	5.7	19.7	5.0	4,900	492	1,804	362	106	47.2	3.6	22.6	7.8
District 2	94	47.0	2.4	14.4	13.0	2,715	325	626	223	82	48.5	4.2	10.6	10.4
Ind., Ill., Ky.	1,317	694.0	66.1	233.9	163.7	36,253	5,159	13,292	3,800	1,299	658.3	69.0	234.1	161.1
Okla., Kans., Mo.	655	366.8	10.9	152.7	38.6	16,681	1,162	8,154	887	617	334.8	18.3	126.9	43.3
Inland Texas	248	180.6	9.4	37.9	20.6	6,516	387	1,163	1,274	243	177.9	9.6	43.3	26.8
Texas Gulf Coast	1,790	883.0	99.7	377.6	225.8	22,959	2,810	8,014	3,629	1,674	805.9	98.1	345.6	216.3
La. Gulf Coast	612	335.0	57.3	148.4	40.3	10,845	1,945	3,935	1,427	567	281.7	50.4	139.9	46.1
N. La. and Ark.	85	33.7	9.7	20.1	6.3	3,700	859	1,353	74	88	36.0	7.7	20.5	7.3
Rocky Mountain:														
New Mexico	20	11.9	1.0	3.0	2.8	196		85	31	18	11.7	0.4	3.2	2.4
Other Rocky Mtn.	203	98.6	2.0	50.9	31.1	7,626	213	1,897	706	247	115.9	3.5	55.1	34.7
California	1,067	451.7	2.9	152.0	349.3	21,962	295	8,151	23,057	1,059	446.1	7.9	153.3	384.9
May 13, 1955	7,061	3,488.0	295.7	1,434.3	1,067.1	171,134	22,951	72,710	44,161	7,038	3,376.8	301.6	1,372.0	1,147.8
May 6, 1955	7,029	3,422.7	296.4	1,472.4	1,075.7	174,243	22,195	70,551	43,305					
May 14, 1954	7,020	3,435.7	288.4	1,279.0	1,162.3	175,750	21,590	65,531	44,996					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

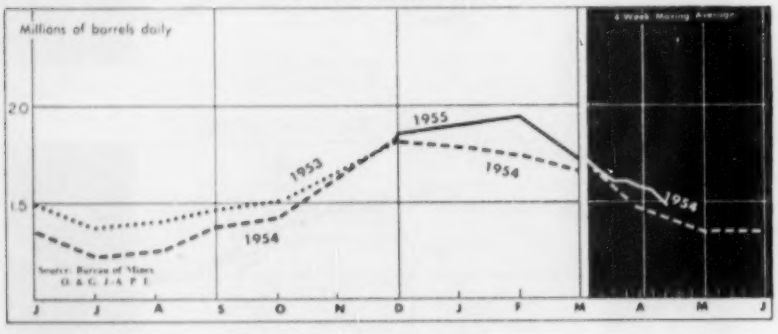
TOTAL GASOLINE DEMAND



TOTAL MIDDLE-DISTILLATE DEMAND



TOTAL RESIDUAL DEMAND



REPRESENTATIVE QUOTATIONS

Spot-market quotations of leading suppliers as of May 18, 1955. Prices are in cents per gallon, except for residual in dollars per barrel and wax in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline	10.75-11.25	11.25-12	10.25-10.75
Premium gasoline	12-12.5	13-13.75	11.50-11.75
42-44 w.w. kerosine	9.5-9.75	10.05	8.75-9.0
No. 2 straw fuel oil	8.75-9.0	9.3	8.25-8.5
No. 6 residual	$1.65-1.75	$2.35-2.45	$1.95-2.00

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	4.5	4.0	4.25
Grade 18-55	5.4	4.9	5.15

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	18
200 vis., No. 3 neutral, 0-10 pp.	13.25

WAX

Mid-Continent

132-134 A.M.P.	6.0

• Heavy fuel is short in some areas east of California. Suppliers are getting slightly higher prices on the Group 3 market. Heavy California-East Coast movement is expected this summer. Spot prices for Group 3 gasoline still hold at 10.75 cents and 12 cents despite higher tank-wagon postings. If high demands continue, price may be up by June 1.

PRODUCTION AND DEMAND — MAJOR PRODUCTS

(Thousands of barrels)

	Refinery prod.	Total demand
Gasoline:		
Four weeks ended 5-13-55	3,445	3,950
February 1955	3,655	3,243
March 1954	3,261	3,331
April 1954	3,298	3,547
Middle distillate:		
Four weeks ended 5-13-55	1,778	1,328
February 1955	2,221	3,036
March 1954	1,811	2,235
April 1954	1,696	1,592
Residual fuel:		
Four weeks ended 5-13-55	1,100	1,495
February 1955	1,239	1,956
March 1954	1,169	1,664
April 1954	1,141	1,479

MOTOR VEHICLE REGISTRATIONS*

	Registrations, 1954	Per cent gain over 1953
Alabama	915,398	6.5
Arizona	379,704	5.7
Arkansas	545,019	3.1
California	5,698,842	3.5
Colorado	682,325	5.2
Connecticut	867,256	4.7
Delaware	139,726	4.3
District of Columbia	195,563	1.7
Florida	1,407,697	8.2
Georgia	1,133,528	4.8
Idaho	314,823	3.5
Illinois	3,087,792	4.4
Indiana	1,682,430	4.5
Iowa	1,143,540	1.6
Kansas	1,001,602	4.7
Kentucky	957,596	5.5
Louisiana	873,800	7.1
Maine	306,002	3.2
Maryland	871,005	6.2
Massachusetts	1,479,889	4.1
Michigan	2,847,745	2.3
Minnesota	1,306,491	2.6
Mississippi	584,530	5.0
Missouri	1,433,878	3.5
Montana	314,329	4.0
Nebraska	636,990	0.8
Nevada	115,182	8.0
New Hampshire	201,967	5.1
New Jersey	1,928,077	5.0
New Mexico	309,517	2.1
New York	4,392,875	5.2
North Carolina	1,304,252	3.8
North Dakota	299,685	2.4
Ohio	3,300,486	4.2
Oklahoma	963,423	3.8
Oregon	764,849	2.7
Pennsylvania	3,553,981	3.9
Rhode Island	294,072	4.8
South Carolina	719,706	0.5
South Dakota	314,636	2.3
Tennessee	1,118,185	6.8
Texas	3,506,599	4.4
Utah	306,646	4.8
Vermont	131,287	2.1
Virginia	1,153,113	5.7
Washington	1,085,158	3.2
West Virginia	513,409	—0.7
Wisconsin	1,336,771	2.6
Wyoming	168,487	3.3
Total U. S.	58,589,863	4.1

*Bureau of Public Roads.

(The schedule of selected crude prices appeared on page 333 of the May 16 issue and will be printed again next week.)

Your MARKET PLACE FOR THE OIL AND GAS INDUSTRY...

CLASSIFIED ADVERTISING

UNDISPLAYED CLASSIFIED 23c a word one issue. 10% Discount three or more consecutive issues. $4.00 minimum charge. Blind Box c/o our care nine words. Payable in Advance.

DISPLAY CLASSIFIED
$16.00 a column inch one issue . . .
10% Discount three or more issues.

Address Classified Advertising Material: The Oil and Gas Journal, P. O. Box 1260, Tulsa 1, Okla.

FOR SALE EQUIPMENT

FOR SALE: ENGINE—165 Hp. Climax Model R61, maximum continuous Hp. rating 126. Herndon Drilling Company, 421 Mayo Building, Tulsa. Phone 4-9700.

8⅝ PIPE 28.55# with collar & P.E. $1.00; also 25 miles of P.E. beveled Rg 3. Ten miles 6⅝ P.E. 19# 75 Cents. R. L. Griffin, Box 2373, Phone 50-0848, Tulsa.

FOR SALE: Surplus Walworth LimiTorque Motor Control Valves, 4" thru 18". Details furnished on request. Write, wire or phone Purchasing Agent, Texas City Refining, Inc., P. O. Box 1271, Texas City, Texas. Ph. 5-4451.

FOR SALE: 1—Beaird—Ingersoll-Rand packaged Compressor Plant, Type 6-JVG (165 H.P.) Heavy Duty, direct connected, 4-cycle, gas engine driven, single stage equipped with 3—4¼ x 9 compressor cylinders, three hand operated fixed volume pockets, two hand operated valve lifters, 20" O.D. 500# W.P. intake scrubber, air starting equipment and controls for automatic operation. Designed for intake pressure range 100#-250#, discharge pressure range 500#-600#. Delivery 3,480 MCF per day at 250# intake, 550# discharge. This plant has been in use less than 30 days and is located near Palestine, Texas. Box H-616, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE

1 Caterpillar generator, A.C., 15 K.W.
1 Century generator, D.C., 10 K.W.
1 General Electric generator, D.C., 10 K.W.
1 Westinghouse, D.C., 10 K.W., generator.
1 Kohler electric plant, D.C., 1½ K.W., 4 cylinder.
1 Kohler electric plant, D.C., 5 K.W., 4 cylinder.
1 Kohler electric plant, 5 K.W., Waukesha motor, F.C.-140.

All in excellent condition, may be seen at Makin Yard, Hobbs, New Mexico, or call 3-4062 or 3-3141.

MAKIN DRILLING COMPANY
P. O. BOX 1628
HOBBS, NEW MEXICO

USED EQUIPMENT

#527—Franks Model 44-TM, Single Drum, Truck Mounted Servicing Unit, 8x10x50' Single Pole Mast, Mounted on FWD Truck.

#536—Franks Model E.T. Single Drum Servicing Unit, 8x10x62' Single Pole Mast, Mounted on 1941 K8-F International Truck.

#526—Franks Super East Texas Double Clutch, Single Drum, Mounted upon K5-11 International Truck. No Mast.

#541—Franks Model ET Single Drum with 8x10x62-ft. Mast, Mounted upon 1948 Model K8 International Truck.

#517—Type 3 O.C.S. Servicing Unit mounted on 1942 Mack Truck. Located Odessa, Texas.

#525—50/60 Ideco Skid Servicing Unit. Double Pole Mast. Mounted on International Tandem Truck.

#533—Cardwell KL Double Drum Spudder with 60 ft. derrick.

Write, Wire or Call

FRANKS MFG. CORPORATION
SUBSIDIARY OF CABOT SHOPS, INC.
BOX 3218, WHITTIER STATION
TULSA, OKLAHOMA

FOR SALE EQUIPMENT

CORE DRILLS, SPUDDERS, ROTARIES: New and used equipment. Everything in supplies. Fishing tools rented. Pressey & Son, Pueblo, Colo.

SALES AND RENTALS. Used cable drilling and fishing tools, casing, production equipment; from the Southwest's largest stock of oil field supplies. Degen Pipe and Supply, Tulsa.

FOR SALE—36-L Bucyrus-Erie Spudder trailer mounted, Casing tackle strut, tool crane, New LO-25 Buda Engine, extra starter, generators, magneto, and sand reel to fit this machine. Write or call The Buckeye Supply Co., P. O. Box 1231, Zanesville, Ohio, Telephone 2-3641.

AIRCRAFT PARTS & REPAIRS
Mr. Aircraft Owner: Take advantage of our extra special service and **vast inventories of Parts, ENGINES, PROPELLERS, TIRES and Supplies. Domestic and Foreign shipments. C A A approved repair station No. 3846.**

VESTCO
Dept. L, Box 5306 T A
Denver 17, Colo.

FOR SALE

1—Used Model O Cardwell drawworks complete with hydramatic brake, automatic catheads and powered by three 6WAKU Waukesha engines. Lovington, New Mexico.
1—Used Model O Cardwell drawworks complete with hydramatic brake, automatic catheads with two engine compound but less the engines. It can be powered with NK or LRO Waukesha engines. This rig is capable of drilling 8000'.
1—Used Wilson Giant drawworks complete with hydramatic brake, automatic catheads and powered by two GMC 671 twin engines. This rig is capable of drilling 7000'.
1—Used Buda engine, Model JL-1335. This engine is capable of pulling a 125 horsepower load satisfactorily.

All equipment in good usable condition and will bear inspection.

For Price and Location
Call or Write

United Supply & Mfg. Company
Drawer 981 — Tulsa, Oklahoma

NEW PIPE

1,000 feet 26" O.D. .188 wall—40' lengths, 51.69 pounds per foot.

4,000 feet 10¾" O.D. 40' lengths, 28 pounds per foot.

NEW BELOW WAREHOUSE PRICE

Immediate Shipment
subject to prior sale

Write, Wire or Phone

BROWN-STRAUSS CORP.
1546 Guinotte Kansas City, Mo.
Phone HA. 1000

FOR SALE EQUIPMENT

MAYHEW HEAVY DUTY 1000 Air and Water Combination Drills. Also truck mounted Schram Air Compressors, water trucks and pickups. All equipment guaranteed first class condition. Write P. O. Box 127, Lovington, New Mexico. Phones 8533 or 3791.

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units, Westinghouse 20-25-30 KW Generating Units.

H. H. COFFIELD
Attn.: W. H. ORR
Phones: 132—Rockdale, Texas
AT-3427—Houston, Texas

LIQUIDATION

5—600 HP IR Type KVG Gas Engine Driven 2 Stage Compressors (1942).
1—660 HP IR Type KVG Gas Engine Driven 2 Stage Compressor (1952).
$50,000 New Spare Parts for Above.
2—IR Starting Air Compressors, Model 25c, Type 40, 265#, 67.6 cfm.

LIQUIDATION LEVELLAND, TEX.

TOWERS: 6'x56' chrome-lined (1951) 6'6"x65', 6'x27', 5'x27', 42"x49', 30"x38'.
HEAT EXCHANGERS: (2) 800 sq. ft. (675# 800° F.) Steel.
VESSELS: 3'10"x38', 325#, 980° F.; 5'3"x38'6" (90# 845° F.) chrome lined.
PUMPS: BJ-St. nl.-chr. pump, 2100' hd., 400 gpm.; IR 15x7x14 steam driven comp.
MISCELL.: Steel, chrome, pipe, valves and fittings, etc. NEW.

AT OTHER LOCATIONS

10—1500, 1000, 430, 360 sq. ft. Steel Ht. Exchangers.
5—850, 424, sq. ft. Adm. Ht. Exchangers.
3—RA-8, MA-4 Clark Gas Engines.
6—325# Vessels 10'x35', 7'x30', 4'x40'.
3—150# Vessels, 10'x20', 8'x16', 6'x30'.
4—Centrifugal Pumps, 2000 gpm. 90' hd., 60 gpm. 460' hd., motor and turb. driven.

ATMOSPHERIC HEAT EXCHANGERS

8—715 sq. ft., 850 psig, 550° F., S.S.
6—470 sq. ft. 850 psig, 550° F., S.S.
2—715 sq. ft. 75 psig, 300° F., S.S.
12—358 sq. ft. 75 psig, 300° F., S.S.
2—108 sq. ft. 75 psig, 300° F., S.S.
5—715 sq. ft. Admiralty 100 psig, 300° F.

WIRE! 'PHONE! WRITE!

Full Details on Request

BRILL EQUIPMENT COMPANY
4101 San Jacinto St., Houston 4, Texas, Locust 1351
Or
2401 Third Ave., New York 51, N. Y., Cypress 2-5703
"We buy from a single item to a complete plant"

FOR SALE EQUIPMENT

FOR SALE—Horizontal Duplex Steam Pumps—10x8½x12—353 GPM—bronze fitted—max. discharge pressure 100 lbs.—6" suction—5" discharge—mfg. by American Marsh Co. Quantity available—NEW—Boston Metals Co. 313 E. Baltimore St., Baltimore 2, Md., Curtis 7-5050.

FOR SALE—Unit Rig Model U-15, available now, Wyoming. For inventory and price write Box H-769, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE—28-L Bucyrus-Erie Spudder, trailer mounted, casing tackle strut. Serial No. 101306. Write or call The Buckeye Supply Co., P. O. Box 1231, Zanesville, Ohio, Telephone 2-3641.

FOR SALE—24-L Bucyrus-Erie Spudder, Serial No. 100471, in perfect condition and with casing tackle strut. Write or call The Buckeye Supply Co., P. O. Box 1231, Zanesville, Ohio, Telephone 2-3641.

SULLIVAN 200 complete with tools ready to work, located Tulsa, Oklahoma. Contact R. F. Mesker, 1129 E. 15th St., Phone 4-9483.

FOUR ALL NEW Linda K Shale Shakers now at Corpus Christi. Will sell at far less than list price. Spare parts are available. Box H-819, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: Two Byron Jackson used 3" x 9"—Ten Stage Hot Oil Pumps with steam turbines, outer case forged steel, inner case nickel cast iron. One used 18" x 5" x 18" National Transit Duplex end packed FS Fluid End Pump, with cast semi-steel water cooled plungers. Details furnished on request. O. G. Jackson, Purchasing Agent, The El Dorado Refining Company, El Dorado, Kansas.

FOR SALE: Complete natural gas compressor setup, containing three 18½" x 20" Worthington single tandem "G" series engines and I.R. steam driven air compressor class FRI. In excellent condition. Also two 90 HP Superior twin engine compressor engines—PANHANDLE PIPE & SUPPLY COMPANY—Phone 63—Box 1068—Borger, Texas.

COMPLETE NATIONAL 50 Drilling Rig Operating West Texas. Not priced at a sacrifice, but excellent terms available to responsible company or individual. Would consider leasing with option to purchase. Box H-824, The Oil and Gas Journal, Tulsa Oklahoma.

WILSON MOGUL double drum rig with 145 GKU Waukesha, 87' mast pole, 6' high 30' long substructure, 12" Brewster rotary, tool house, water tank, 5" x 10" slush pump with engine, tongs, slips, generating set, shale shaker, complete with all hand tools. Three (3) years old, $25,000.00. Stored at Odessa. Norvell-Wilder Supply Company, Box 2178, Houston, AT-3471.

SAVE MONEY
on
8" LINE PIPE
LAPWELD 8⅝" O.D. 28.55

Very good No. 1 grade, used pipe. Straight 20' single random lengths machine cleaned.
Choice of plain end or T&C. Ideal for oil, water and gas systems, 850 to 900 psi.
Pipe located in Illinois, with low barge, rail and water rates to any part of the world. Priced below market, selling at almost ½ cost of equivalent new pipe.
Will sell for cash or will finance meritorious propositions.

Brokers and agents protected

REDNER PIPE CO.
P. O. Box 1798 Shreveport, La.
Phone 2-3276

GASOLINE PLANT *FOR SALE*

Gasoline Plant, located in Brazoria County, Texas, shut down in January 1954. Had been processing approximately thirty-three million feet of gas daily with absorber pressure approximately six hundred thirty pounds. Plant recovered Propane, Butane, Gasoline, Kerosene and Diesel Oil. Detailed inventory available upon request.

SOUTHERN PRODUCTION CO., INC.
P. O. Box 670, Ft. Worth, Texas

FOR SALE EQUIPMENT

GAS METERS: Westcott and Foxboro Orifice Meters and Controllers. Bristol and Taylor Recording Pressure Gauges. GEO. R. MILNER, P. O. Box 124, OKMULGEE, OKLAHOMA.

FOR SALE: Wilson Mogul Torcair; G.M. powered—96' Lee C. Moore Mast—16" Oil Well Pump—4000'—4½" DP—Located east central Oklahoma—price $50,000.00. Write Box H-821, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE—Wilson Giant Rig, available now, Wyoming. For inventory and price write Box H-770, The Oil and Gas Journal, Tulsa, Oklahoma.

EQUIPMENT WANTED

WILL PAY highest prices for used casing, used line pipe, and abandoned leases. Gore Oil Field Supplies, Box 1063. Phone 3-6866 or 6-9747, Tulsa, Oklahoma.

PIPE THREADING MACHINES. Landis must have receding Chaser Dye Heads. 2 only 8⅝" OD, 1 only 13⅜" OD. Please phone model and Head numbers when you phone or write us. VALLEY STEEL PRODUCTS CO., Box 257, Phone 686, Flora, Illinois.

EQUIPMENT WANTED: Cardwell or other slim hole outfit for ten thousand foot work. With or without engines. Appliances and tools in good condition. No drill pipe. Give location and price. Oil Well (Seventeen) drilling unit, with or without engine. Price and location. Heavy spudder for seven thousand foot work. With or without tools. Give location and price. Box H-817, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

ACCOUNTANT
Opportunity for varied experience in Dallas office of independent oil company. Recent college graduate, preferably with 1 - 2 years' experience. Draft exempt—not over 32. P. O. Box 2775, Dallas, Texas.

GENERAL MANAGER for integrated oil company in South America. Prefer geological or petroleum engineering background with college degree and experience. Must also be a capable administrator and supervisor. Salary commensurate with experience and qualifications. Send detailed personal history and work experience to Box H-795, The Oil and Gas Journal, Tulsa, Oklahoma.

TERMINALS ENGINEERS
For MAJOR OIL COMPANY

Several openings for Mechanical or Civil Engineers for assignment to the FAR EAST.

Candidates should possess experience in the following:

- **Bulk shipping**
- **Bulk packaging and container manufacture**
- **Machine maintenance**
- **Receiving and storage of petroleum products**
- **Knowledge administrative procedures and general accounting.**

Candidates must meet the following requirements:

- **2 to 3 years' general engineering experience.**
- **Interested in foreign employment in the FAR EAST.**
- **B.S. degree from recognized college or university.**
- **Age 25-35, single or married.**

Salary commensurate with background and experience, plus foreign service premium, quarters and living allowance and complete employee benefits:

Send detailed resume to:
Box H-810, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

FOR A BETTER-PAID JOB

Production and Reservoir Engineers, Geologists, Draftsmen; Geophysicists, Party Chiefs, Computers and Field Crew Staff. WRITE US—STRICTEST CONFIDENCE.

GOOD EMPLOYMENT AGENCY
1554 California, Denver. AC 0835

PETROLEUM ENGINEER OR GEOLOGIST

with broad general knowledge of the petroleum industry in East Texas, North Louisiana and South Arkansas to fill position with well established firm in area. State qualifications in detail.

Box H-705, The Oil and Gas Journal, Tulsa, Oklahoma.

SALES ENGINEER

Oil equipment manufacturer has opening for sales engineer for customer contacts and assisting distributors on field sales activities. Salary commensurate with experience and qualifications. Age preference 30 to 40 years. Require detailed personal and work history along with photograph to

BOX H-801,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

GEOLOGIST

Independent oil company has opening June 1 in Tulsa office for qualified sub-surface geologist. Must be familiar with Mid-Continent Area, particularly Oklahoma, and be capable of handling geological operations at divisional level. Age limit 40. Excellent position for right party. Give complete past employment record and educational background. All replies confidential.

Box H-804,
The Oil and Gas Journal,
Tulsa, Oklahoma.

Chemical Engineer
Unusual Opportunity

Unusual opening with moderate size, well-established engineering firm for young chemical engineer preferably with major company or equivalent experience. Good educational background and four or more years experience with modern refinery processing and design and economic studies. Acquaintance with catalytic reforming and cracking desirable.

An ambitious and resourceful engineer will find this an outstanding opportunity for personal advancement in assuming responsibility for many diverse projects in the oil and chemical industries. Very desirable location. A moderate amount of traveling is involved. Salary commensurate with ability.

BOX H-811,

The Oil and Gas Journal,
Tulsa, Oklahoma

HELP WANTED

IMMEDIATE OPENING for graduate engineer desiring sales work. Home office location, Tulsa, Oklahoma. Give complete resume of experience, references, and salary expected in first reply. Box H-803, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL ENGINEER

Houston Refinery has opening for Chemical Engineer with minimum five years experience in petroleum refinery or related field, including three years process design work. Salary open.

Send complete resume to

P. O. Box 5008,
HARRISBURG STATION,
HOUSTON 12, TEXAS.

PROCESS DESIGN ENGINEER

If you have a degree in chemical engineering and 5 to 10 years diversified process design experience in petroleum and chemical industries, and are interested in a process design position with a future, you should consider joining the McKee organization.

Please send complete personal details including salary requirements, to:

EDWARD A. KOLNER

Arthur G. McKee & Company
2300 Chester Avenue
CLEVELAND 1, OHIO

HELP WANTED

FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co., Box 2603, Tulsa, Okla. $5.00 cash.

GEOLOGIST of outstanding ability, under 35, with at least 3 years' experience in northern Louisiana, gulf coast and west Texas areas. Exploration and development experience essential for Dallas office of established independent oil concern. P. O. Box 2775, Dallas, Texas.

SOUTH AMERICA. Major Oil Company. Our fee paid. Mechanical Engineer - Petroleum Engineer, Producing or Drilling - Chemical Engineer - Geologist (must be single)—All requiring Degree, experienced or inexperienced. Mud Technician - two or more years' experience, single. Tool Pusher, three years experience. Foreman Pump Station, three to five years experience. On all jobs age limit is 40. All information confidential. Contact CHAS. J. LOVELESS PERSONNEL SERVICE, 616 S. Main, Tulsa, Oklahoma—Phone 4-3193.

Experienced Reservoir Engineer

Anderson-Prichard has an opening in their Oklahoma City office for an engineer having a minimum of two years experience in reservoir work. Applicant should write giving personal history, a brief resume of education and professional experience and salary expected. All applications will be confidential.

Please address Anderson-Prichard Oil Corporation, Liberty Bank Building, Oklahoma City, Oklahoma. Attention: Mr. D. F. Tver, Industrial Relations Department.

HELP WANTED

CHEMICAL ENGINEER with at least two years Refinery or Petrochemical experience for position in Research and Development Department located in Tulsa. State qualifications and salary expected. Write Personnel Director, Post Office Box 381, Tulsa, Oklahoma.

Management Position Open

Important managerial position with opportunity for further advancement is open in large integrated oil company with operations in Mid-Continent-Rocky Mountain area. Annual salary commensurate with ability and experience will exceed $25,000. Geological experience and training desirable. Applicant should supply complete resume of experience and qualifications which will be treated confidentially.

Box H-808, The Oil and Gas Journal, Tulsa, Oklahoma.

STAFFING NEW OIL REFINERY

COMMONWEALTH OIL REFINING CO. INC.

Building complete new refinery near
PONCE, PUERTO RICO
requires
Experienced Refinery Personnel

Operating Superintendent
Foremen, Stillmen, Operators
Instrument Supervisor, Senior Chemist

Crude Distillation, Houdriflow Cat Cracking, Cat Reforming, Cat Poly, Alkylation, Gas Recovery, Light Oil Treating

Write, giving complete resume to

Commonwealth Oil Refining Co. Inc.
161 East 42 Street
New York 17, N. Y.

OVERSEAS OPPORTUNITIES

affiliates of

STANDARD OIL COMPANY (N. J.)

located in South America need . . .

PETROLEUM ENGINEERS:

Vacancies include drilling, production, equipment engineering, and/or reservoir studies.

REFINERY INSPECTION ENGINEERS:

Will be required to inspect oil refinery equipment and request equipment renewals where corrosion, failure, or defectiveness under safety code makes necessary.

CHEMICAL ENGINEERS:

Refinery process engineering assignments include design, control, economic studies and/or scheduling of operating programs.

QUALIFICATIONS: Age 25 - 38, engineering degree and several years professional experience in oil industry. Consideration can be given to United States citizens only.

★ ★ ★

These are regular staff positions offering liberal salary and benefit plans.

★ ★ ★

WRITE, giving complete address, age, marital status, education and details of past experience.

Box 308-O, Radio City Station, New York 19, N. Y.

SENIOR ENGINEER

For MAJOR OIL COMPANY in Indonesia.

Candidates should possess the following qualifications:

- B. S. Degree in C. E. or M. E. from recognized college or university.
- 10 years' experience in design, cost estimation and advanced planning in producing phase of petroleum industry.
- Interested in foreign employment.

Duties will involve the following:

- Overall planning of major camp engineering projects.
- Design new construction.
- Supervision of Engineering Department.
- Establishment of engineering specifications.
- Provide technical services for all departments.

Salary commensurate with background and experience, plus foreign service premium, quarters and living allowance and complete employee benefits.

Send detailed resume to:
Box H-809, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

THE STANDARD OIL COMPANY (OHIO)

Manufacturing (Refining) Department

is looking for

CHEMICAL ENGINEERS, CHEMISTS, and MECHANICAL ENGINEERS

with one to five years experience in petroleum refining or related activities for staff work primarily in Cleveland, Ohio. Possible employment in Toledo, Lima, or Cincinnati, also.

Applicant should have the following educational background and industrial experience:

CHEMICAL ENGINEERS: B.S. or higher degree and experience in development, pilot plant operation, process design, process trouble shooting, refinery process engineering, economic studies, or related work background.

CHEMISTS: B.S. or higher degree and experience in product and process research or development.

MECHANICAL ENGINEERS: B.S. or M.S. degree and experience in process equipment construction, design, inspection, or maintenance, petroleum product testing and field evaluation, or related work background.

Age Range 22 - 32

Salaries commensurate with experience and level in organization. Advance on merit basis.

If you can qualify and are looking for a permanent job with a growing but secure midwest company, write, giving full information on education, industrial experience, military experience, and personal data to

E. G. GLASS, JR.

1737 Midland Building, Cleveland 15, Ohio.

OIL INDUSTRY Employment Service. Tom Robinson, owner, 405 Tuloma Bldg., Tulsa, Oklahoma. For technical and trained oil industry personnel.

PROCESS ENGINEER with thorough technical training and background of engineering and operating experience with special emphasis on catalytic and thermal reforming, alkylation and petrochemicals. Send complete record of education, experience, and minimum salary expected. Write Box H-723, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Junior Petroleum Reservoir Engineer having 2 or 3 years experience. Location of employment, Tulsa, Oklahoma. Give qualifications, references and salary expected in first reply. Our employees are aware of this ad. All replies will be held confidential. Box H-785, The Oil and Gas Journal, Tulsa, Oklahoma.

SALESMAN for Kansas area. Must be familiar with drilling and mechanical equipment. Excellent opportunity. In applying give qualifications, experience, and salary expected. Replies will be held confidential. Our employees have been advised of this opening. Box H-807, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGISTS

Major oil company in U. S. has openings overseas for geologists who are United States citizens. Excellent opportunities for men with limited or extended geological experience.

Send details—age, education, marital status and experience. Replies will be treated confidentially.

BOX H-814.

THE OIL AND GAS JOURNAL.

TULSA, OKLAHOMA.

HELP WANTED

EXCEPTIONAL OPPORTUNITY for Graduate Petroleum Engineer, under 25, with Independent Oil Company. Should have at least three years' experience in the gulf coast, northern Louisiana, and West Texas areas. Must be outstanding in work-over analysis, economic evaluation, reserve calculations, electric analysis interpretation and reservoir studies. P. O. Box 2775, Dallas, Texas.

SITUATIONS WANTED

GEOLOGIST, 6 years South Texas experience desires new affiliation. Box H-791, The Oil and Gas Journal, Tulsa, Oklahoma.

PROCESS ENGINEER, 30, family, 8 years thorough exceptionally, diversified process control engineering and supervision at two of world's largest refineries. Currently in South America. Will locate responsible organization desirable area USA or elsewhere if unusual challenging situation. Box H-813, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE Petroleum Engineer with sixteen years experience in engineering, drilling and production for major and independent operators desires connection with active independent. Box H-806, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER presently employed in supervisory position major company desires opportunity in operational-management field. Broad experience includes 9 years production, 4 years construction, and 4 years seismograph operation. Age 41, excellent references. Box H-797, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE Petroleum Engineer with 23 years experience in Okla., Kansas, Texas, and Illinois as Engineer, Production Superintendent, and Production Manager. Box H-802, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

PETROLEUM ENGINEER, Masters degree, 30, married, family, seven years Latin America. Workovers, well completions, reservoir studies, water and gas injection. Employed. Box H-786, The Oil and Gas Journal, Tulsa, Oklahoma.

REFINERY MAINTENANCE ENGINEER, equipment inspector. Over 7 years experience, incl. 4 years foreign, working with equipment in many phases of refinery operation. Desire oil company or refinery construction work. Graduate engineer. Speak Spanish. Will consider foreign employment. Box H-784, The Oil and Gas Journal, Tulsa, Oklahoma.

SUBSURFACE GEOLOGIST, single, 29, 4½ years broad experience, now with Major in South, desires position in Denver area. Box H-812, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGICAL ENGINEER, 29, M.S. Geology, B.S. Mechanical Engineering (Petroleum Production Option), 4 years Geological and Production Experience with Major Company in Kansas and Oklahoma. Desire Position with Independent. Box H-755, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICAL SUPERVISOR, 35, graduate, 13 years major company experience in Colombia and Venezuela. Employed. Desires foreign employment with chance for advancement. Prefers major company work in Middle East or Africa. Box H-794, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED Geological Engineer available soon. Thoroughly trained in property evaluation, drilling and development, and waterflooding in Oklahoma, Kansas, Texas and Illinois. Box H-823, The Oil and Gas Journal, Tulsa, Oklahoma.

DISTRICT GEOLOGIST desires position with independent operator or company on interest basis. Thoroughly qualified in all phases exploration, drilling, producing and leasing deals. Nine years subsurface experience Central and W. Texas and SE N. Mexico with major and small companies. Age 35. Now located W. Texas. Box H-822, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE GEOLOGIST, Missouri 1948. Desires work in photo geology or similar field. Experience includes 4 years Army Map Service in Multiplex and Mosaic Map work. Presently employed with State Highway Department with limited funds and no equipment. Box H-815, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER: 36, married, 8 years diversified drilling, remedial and production experience with major company in Texas and New Mexico. Licensed Professional Engineer. Desire responsible position with independent as either production supervisor or engineer. Box H-816, The Oil and Gas Journal, Tulsa, Oklahoma.

REFINERY Operations Supervisor, over 13 years refinery experience, 8 years foreman, cat cracker, etc. Box H-818, The Oil and Gas Journal, Tulsa, Oklahoma.

ELECTRIC LOG CABINETS

FOR ECONOMICAL FILING of full-size electric logs, most geologists prefer Kraftbilt E-24 4-drawer cabinet. Two compartments to each drawer with separate follow blocks make this cabinet handy, economical. For filing reduced electric logs, geologists use Kraftbilt E-28 8-drawer cabinet. Send for new Catalog 1054-B. Ross-Martin Co., P. O. Box 800-A, Tulsa 1, Oklahoma.

REAL ESTATE

CENTRAL TEXAS RANCH—3,918 acres, 200 in cultivation, $60,000 improvements, on highway, walk out deal, for full particulars, write, R. V. Wittenburg (agent), Lometa, Texas.

BUSINESS IS GOOD IN THE TRI-STATE—so we're moving into larger quarters next door. Will lease our present modern well-located shop and store to reputable supply or service concern non-competitive to our industrial supply and machine-welding-repair shop. Mid-East Supply and Machine, Box 253, Fairfield, Illinois.

MAP WEIGHTS

JUST LIKE AN EXTRA PAIR OF HANDS, Kraftbilt 20-ounce cream-colored horsehide weights hug drawings or maps to the table while you work. Hand-sewn with heavy duty stitching, they're shot-filled and round in shape for ease of use and long life. Ask for Catalog 1054-B. Ross-Martin Co., P. O. Box 800-A, Tulsa 1, Oklahoma.

ROYALTIES

OFFERING AND BUYING Choice Oil and Gas Income Royalties, Oil Properties, Leases and Royalties ahead of drilling. Small Buyers Solicited. A. S. Berry, P. O. Box 1383, Tulsa, Oklahoma.

PIPELINES ANNOUNCED: Projected pipelines indicate increasing action in central Williston Basin, where we specialize in royalties in major company blocks. For informative material, write LANDOWNERS ROYALTIES COMPANY, Box 1225, Great Falls, Mont.

JACK EAGLE, Oil Properties, 706 City Nat'l. Bldg., Oklahoma City, Oklahoma, Telephone REgent 6-7027.

LEASE AND DRILLING BLOCKS

CONTACT A. L. Bowles, Box 947, Ada, Okla., for Drilling Deals, Oil Investments.

LOCATION KANSAS—200 acre lease, 4 producing wells, 3—100 bbl. tanks, equipment new, will drill two additional wells, all for $17,500. Box 114, Erie, Kansas.

CALIFORNIA LEASE BLOCKS: 1000 acres L. A. Basin: 2500 acres South Cuyama. R. D. Freed, 1140 East Grand Ave., El Segundo, California.

KANSAS WATER FLOOD
1500 Acres near Chanute, 6 wells, pumps, tanks, and other equipment, 600 feet depth. Turn it over for development, or sell reasonable. Owner, O'Chamis, 10863 Bluffside, No. Hollywood, Calif., Ph. SU 2-6105.

VERY REASONABLY priced, approx. 20,000 acres government (leased) grant land in McKinley and Sandoval Counties, New Mexico, northeast of A.C.M. Co. world's largest uranium mine. Geology is the best with many high anomaly readings. Wire or write Peters—P. O. Box 967, Albuquerque, New Mexico.

AM LOOKING for proven locations to drill this year on a fair basis. If you have a drilling commitment that is proven I would like to hear from you. Am not interested in buying production nor wildcatting but am interested in substantial program with my own money on proven stuff, preferably less than 3500 feet. Box H-790, The Oil and Gas Journal, Tulsa, Oklahoma.

LEASES ROYALTIES
Producing and Nonproducing
Bought and Sold—Any Area
Inquiries Invited
B. D. BUCKLEY
6635 Delmar Ave., St. Louis, Mo.

BUSINESS SERVICE

Delaware Corporations formed and serviced. American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware.

LEGAL NOTICE

ANTI-TRUST CASE SETTLED. After extended negotiation, upon consent of the parties and without trial of the case, upon April 7, 1955, a final judgment was entered in the case of United States of America vs. Magcobar, Inc., Dresser Industries, Inc., Clarence J. Coberly, Dresser Equipment Company and Kobe, Inc., Civil No. 13460-BH. Under the terms of this judgment, Kobe, Inc. is required to grant licenses under its patents relating to hydraulic oil well pumps on a reasonable royalty basis. A list of such patents and a copy of such final judgment will be furnished upon request to **Kobe, Inc.**, 3040 East Slauson Avenue, Huntington Park, California.

LEGAL

Sealed bids will be received until June 9, 2:00 P. M. Mountain Standard Time, and opened at that time in the office of the Superintendent, Fort Belknap Consolidated Agency, Harlem, Montana, for the leasing of 5,371.93 acres of Tribal land and 27,600.12 acres of allotted Indian land located in Township 30 N., Range 24 E., Township 31 N., Range 24 E., Township 31 N., Range 25 E., and Township 30 N., Range 25 E., Blaine County, Montana for oil and gas mining purposes. For further detailed information and a list of lands advertised call or write: Darrell Fleming, Supt. Fort Belknap Consolidated Agency, Harlem, Montana. Telephone 5-R-4.

ADVERTISERS

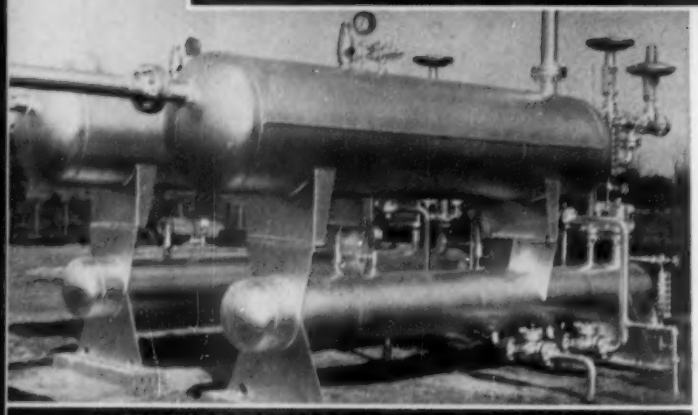
Acme Oil Tool Company 195
Aeroquip Corporation 34
Aldrich Pump Company, The 29
Allis-Chalmers Mfg. Co. 58
Alten Foundry & Machine Works, Inc. 182
Amercoat Corporation 54
American Chain Division of American Chain & Cable 192
American Chemical Paint Company 160
American Hoist & Derrick Co. 166
American Iron & Machine Works Co. 187
American Manufacturing Co. of Texas 7
American Telephone & Telegraph Co. 140
Atlas Powder Company, Chemicals Department 25
Automatic Sprinkler Corporation of America 161
Baash-Ross Tool Company 199
Baird Mfg. Co. 195
Baker Oil Tools, Inc. 74
Bechtel Corporation 132
Bethlehem Steel Co. 22
Bethlehem Supply Co. 101
Brakesol, Inc. 142
Braun & Co, C F 160
Bristol Company, The 24
Broderick & Bascom Rope Co. Back Cover
Byron Jackson Co. 48
Cardwell Mfg. Co., Inc. 62, 63
Chemical Process Co., The 67
Classified Advertising 211, 212, 213, 214
Climax Engine and Pump Mfg. Co. 23
Coast Paint & Lacquer Co. Inc. 197
Construction Machinery Company 167
Continental Electric Motors 155
Cooper, Inc., Fred E. 149
Coppus Engineering Corp. 5
Crane Co. 123
Crose Manufacturing Co., Inc., M. J. 64
Crossett Chemical Company Division of The Crossett Company 157
Dean Brothers Pumps, Inc. 185
Dearborn Chemical Company 11
Deming Company, The 156
Detroit Diesel Engine Division, General Motors Corp. 52
Dicalite Division Great Lakes Carbon Corporation 177
Dowell Incorporated 180, Inside Back Cover
Dresser Manufacturing Division 143
Drilling & Service, Inc. 196
Duff-Norton Company 191
Eastman Oil Well Survey Company 194
Edward Valves, Inc. 43
Emerol Mfg. Co. 32
Gates Rubber Co., The 189
General American Transportation Corporation 128
General Electric Co., Electronic Dept. 36
Geolograph Company, Inc., The 185
Geophysical Service Inc. 175
Gilbert & Barker Mfg. Co. 44
Goodrich Chemical Company, B. F. (Hycar) 9
Grancell, I. H. 145
Guiberson Corporation 65
Gustin-Bacon Manufacturing Co. 178
Halliburton Oil Well Cementing Co. Inside Front Cover, 15
Hercules Tool Company 176
Hughes Tool Co. 115, 116

"No Cadillac this year, Pop. Him say, dry hole."

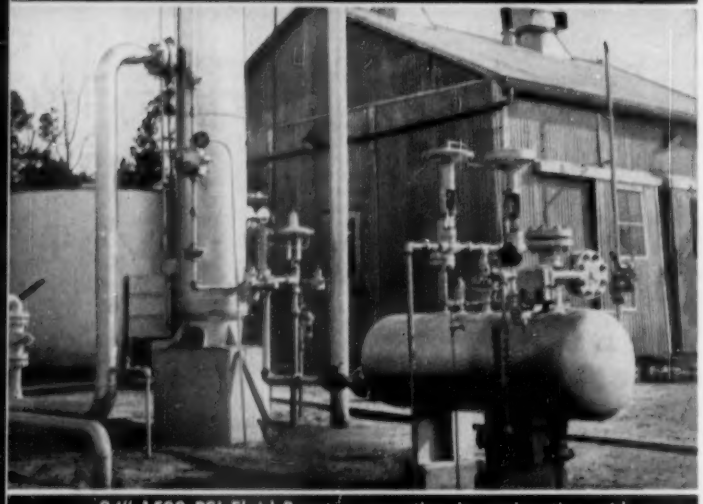
Inferno Co., The 145
Infilco Incorporated 56
International Business Machines Corporation 59
Jacobson Maps, E. C. 142
Jensen Brothers Mfg. Co., Inc. 181
Johnston Testers, Inc. 57
Jones & Laughlin Steel Corporation Supply Division 51
Kellite 158
Kelley Company, Ben F. 166
Kellogg Co., The M. W. 31
Kennametal, Inc. 33
Kerrigan Iron Works, Inc. 193
Kerr-McGee Oil Industries, Inc. 37
Kohler Co. 192
Lane-Wells Company 72
Larkin Packer Company, Inc. 124, 125
Leland Equipment Co. 66
Lincoln Electric Company, The 159
Lockett & Company, Ltd., A. M. 176
Lone Star Cement Corporation 76
Macco Oil Tool Co. 160
Magnet Cove Barium Corp. 190
Maloney-Crawford Tank & Mfg. Co. 55
Manzel Division of Frontier Industries, Inc. 160
Marlow Pumps Division of Bell & Gossett Company 179
Martin-Decker Corp. 176
McCullough Tool Company 202
McKee & Co., Arthur G. 46
Minneapolis-Honeywell Regulator Co., Industrial Division 146, 147
Mission Mfg. Company 150, 151
Murphy Diesel Company 49
National Supply Co., The 39, 40, 41, 42
National Tank Company 216
Naugatuck Chemical Division of United States Rubber Company 47
Nelson Electric Mfg. Co. 157
Newport News Shipbuilding and Dry Dock Company 50
New York Air Brake Company, The 10
Nordstrom Valve Division, Rockwell Manufacturing Company 16, 17
Norris Manufacturer, Inc., W. C. 97
Oakite Products, Inc. 162
Oil Center Tool Co. 68
Oil Well Supply Division 6
OPW Corporation 4
Orbit Valve Company 136
Otis Pressure Control, Inc. 61
Parkersburg Rig & Reel Co. 30
Parsons Company, The Ralph M. 38
Parlow Corp., The 155
Peerless Pump Division of Food Machinery & Chemical Corporation 163
Peerless Supply Co. Inc. 195
Penberthy Injector Co. 53
Petreco A Division of Petrolite Corporation 21
Petroleum Distributing Co. 70
Petroleum Electric Power Assn. 8
Powell Valves 20
Precision Scientific Company 70, 71
Ratigan, Inc., J. P. 195
Reed Roller Bit Company 183
Sargent Engineering Corporation 35
Seismograph Service Corp. 171
Shand & Jurs Co. 201
Smith Corporation, A. O.—Meter Division 26, 27
Smith Oil Tool Co., H. C. 144
Southern California Oil Tool Company 67
Southern Mill & Mfg. Co. 184
Southwest Industries, Inc. 93
Taylor Forge & Pipe Works 152
Thermoid Company 45
Thompson Tool Co. 186
Tube-Kote, Inc. 173
Union Tank and Supply Company 66
Unit Rig & Equipment Co. 18
United States Rubber Company, Naugatuck Chemical Division 47
United States Steel Corporation—Oil Well Supply Division 6
Universal Atlas Cement Co. 168
Vogt Machine Co., Henry 12, 13
Wallace & Tiernan Products, Inc. 155, 200
Watson-Stillman Fittings Division H. K. Porter Company, Inc. 60
Waukesha Motor Company 14
Well Equipment Mfg. Corp. 148
Wheeling Machine Products Company 174
Williams Brothers 69
Williams Company, W. Horace 19
Wilson Products, Inc. 198
Wisconsin Motor Corporation 188
W-K-M Manufacturing Company, Inc., A Subsidiary of ACF Industries Incorporated 28
Worthington Corporation 185

National

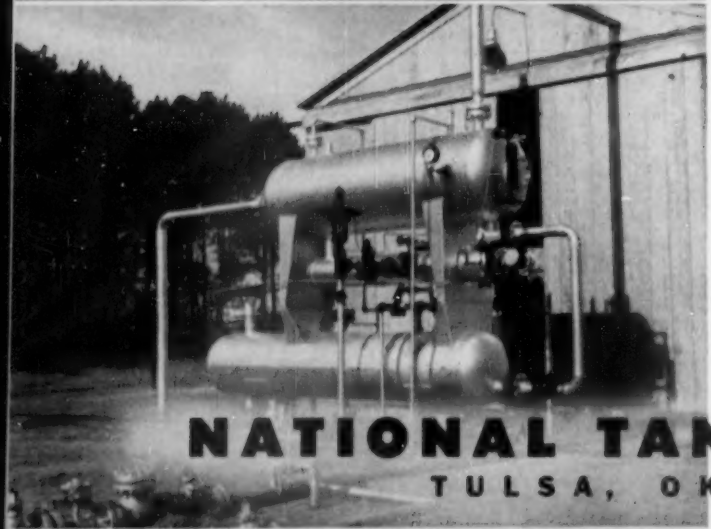
COMBINATION SEPARATOR & FLUID BOOSTER



2–30" 500 PSI Oil and Gas Separators with 16" 1200 PSI BOOSTERS. Compressing gas at this site from 350 PSI to 1100 PSI.

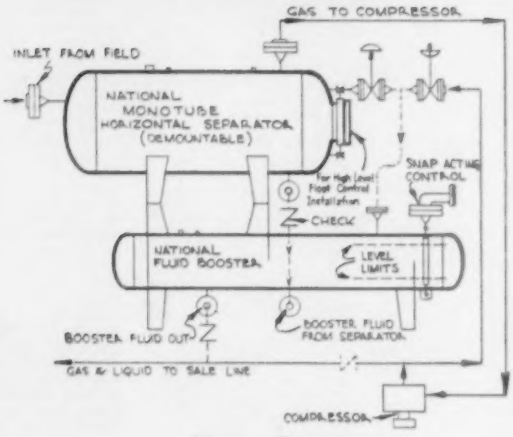


24" 1500 PSI Fluid Booster operating in conjunction with a vertical Oil and Gas Separator and Gas Compressor.



30" 1000 PSI Oil and Gas Separator with 10" Water Leg and 24" 1500 PSI BOOSTER. Fluid is boosted from 800 PSI line into 1350 PSI line.

(Patented and Patents Pending)



FLOW DIAGRAM

APPLICATION

Usual application is in producing areas where well head pressures have fallen to a less pressure than the existing gas sale line pressure. Here the unit is used in conjunction with a gas compressor.

Typical of this situation is the Carthage Field in East Texas which is supplying gas to a 1050 PSI transmission and gathering line whereas the field producing pressures have fallen to 400-600 PSI.

OPERATION

The fully automatic unit operates as follows: The well product enters the separator where gas is separated and scrubbed of any entrained liquid. The liquid flows to the booster and gas flows to a compressor. When fluid level builds up in the booster to a prescribed level, a snap action control opens and closes simultaneously the two valves in the line from the discharge side of the compressor. No gas is vented when double valving is used. Pressure equalizes on the booster with that of the compressor outlet. The liquid then flows from the booster and is commingled with the gas downstream of the compressor and flows then into the sale line.

It's a National

NATIONAL TANK COMPANY

TULSA, OKLAHOMA

XM ACID

Acid additive developed by Dowell helped to increase production from 6 to 480 BOPD—after regular acidizing failed

Dowell addition agents and acidizing techniques give a big boost to your chances of more successful well completions and more profitable production.

For example, here's the case of a well completed in a dolomitic formation. Two successive regular acidizing treatments had raised the well's output from 6 BOPD natural to 30 BOPD. Then the well was acidized by Dowell using XM Acid. As a result, production jumped to 480 BOPD!

These results indicate that in the two regular acidizing treatments, clay and silicate materials were swollen by spent hydrochloric acid and had partially plugged the flow channels. Often in such cases, regular acidizing actually decreases production. However, XM Acid contains a Dowell-developed additive which is designed to control silicate swelling and eliminate such plugging.

For full information about modern acidizing services tailored to your well, call the nearest Dowell office. Or write Dowell Incorporated, Tulsa 1, Oklahoma, Dept. E-11.

services for the oil industry

DOWELL

A SERVICE SUBSIDIARY OF THE DOW CHEMICAL COMPANY

BRODERICK & BASCOM ANNOUNCES

NEW

YELLOW STRAND "POWERSTEEL" WIRE ROPE

Another addition to the famous Yellow Strand family — the new "POWERSTEEL!" Made of higher carbon content steel, new "POWERSTEEL" is 15% stronger, assures longer life. It withstands shock, resists wear. Preformed, with Independent Wire Rope Core, "POWERSTEEL" is a heavy-duty, crush-resistant rope, designed for long service.

STRONGER LONGER LIFE!

Yellow Strand "POWERSTEEL" was proved in military service in World War II. Its long life has been established on rugged logging operations. Broderick & Bascom is now presenting this higher quality rope to industry. Check on Yellow Strand "POWERSTEEL" for your tough jobs — where extra strength is needed. See your Broderick & Bascom distributor, or write the branch nearest you for information.

Yellow Strand®

BRODERICK & BASCOM ROPE CO.
4203 UNION BLVD. - ST. LOUIS 15, MO.

Manufacturers of Wire Rope for 79 Years

466 EDMUNDS ST. SEATTLE 8, WASH.	35-30 43rd AVE. LONG ISLAND CITY 1, N.Y.	1818 N.W. MARSHALL ST. PORTLAND 9, ORE.	1330 W. FULTON ST. CHICAGO 7, ILL.
66 POTRERO AVE. SAN FRANCISCO 3, CALIF.	3441 HUNTER ST. LOS ANGELES 51, CALIF.	317 JEFFERSON HIGHWAY NEW ORLEANS, LA.	9280 MARKET ST. ROAC HOUSTON 15, TEXAS